CEREAL SCIENCE *today*

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MAY 1957

VOLUME 2 • NUMBER 5

AN OFFICIAL PUBLICATION OF THE AMERICAN ASSOCIATION OF CEREAL CHEMISTS

OF INTEREST THIS MONTH

CANADA'S GRAIN RESEARCH LABORATORY

VARIANCE IN BUHLER MILLS

EFFECTS OF GAMMA IRRADIATION ON BREAD

White Flour in the U.S.A.—

Enriched* with Vitamins and Iron for Better Nutrition

by Science Writer

This article is one of a series devoted to the enrichment of family white flour, white bread and rolls, corn meal and grits, macaroni products and white rice.

The enrichment of family white flour with thiamine, riboflavin, niacin and iron by American millers is a major success. It has made great contributions to better health in the United States by improving a staple food.

Since the start of the program in 1941 by millers, voluntarily, the evidence is conclusive that enrichment not only has reduced the number of cases of certain dietary diseases but also is promoting the mental and physical vigor and well-being of the U. S. population generally. Because of its demonstrated value, the principle and practice of enrichment have been applied to other foods made from grains: corn meal and grits, white rice, macaroni, spaghetti, noodles, pastina, farina—and, of course, to white bread and rolls.

Doctors and diet experts have long supported white flour enrichment. The Council on Foods and Nutrition of the American Medical Association and the Food and Nutrition Board of the National Research Council are on record as endorsing the practice.

The legislatures of a majority of the States plus Hawaii and Puerto Rico have enacted laws which make mandatory the enrichment of all family white flour, as well as white bread, sold commercially in those areas.

American homemakers, too, favor foods they know to be enriched—a fact demonstrated by surveys. They look for these words on package labels: "Enriched with vitamins and iron for better nutrition."

What Is Enrichment?

It's an axiom in the milling industry that consumers want beautifully fine, white flour. When wheat is milled and processed to get the white flour which the public demands, vitamin and mineral values are unavoidably lost.

Enrichment restores to white flour the following important vitamin and mineral factors: thiamine, riboflavin, niacin and iron. Calcium also may be added as an optional ingredient. The process is simple and inexpensive. A mixture of the vitamins and iron is fed into the flour stream during processing. This insures that the enriching ingredients are spread evenly throughout the flour.

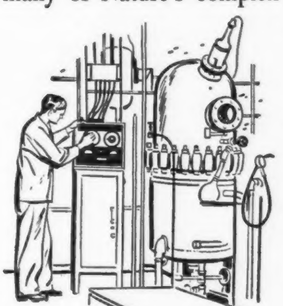
The U. S. Food and Drug Administration has established standards which white flour must meet to be properly labeled enriched. The requirements, in milligrams per pound, are:

	Min.	*Max.*
Thiamine (vitamin B_1)	2.0	2.5
Riboflavin (vitamin B_2)	1.2	1.5
Niacin (another "B" vitamin)	16.0	20.0
Iron	13.0	16.5

(In Canada, too, the same standards have been set for enriched white flour through the amendment of the Food and Drugs Act.)

Vitamins Are Made

The science of chemistry is so advanced these days that many of Nature's complex substances can be "duplicated" in the laboratory. This has happened with many vitamins. First, the chemical composition is learned. Second, the pure substance is isolated. Third, a "duplicate" is made by synthesis. And fourth, the laboratory techniques are extended to large scale operation.



The manufactured "duplicate" is identical chemically and in biological activity with Nature's own product. A vitamin is still a vitamin regardless of its source. So efficient is large scale manufacturing that vitamins are sold at a lower cost than if they were extracted from natural sources.

The Hoffmann-La Roche people make top quality vitamins actually by the tons. To do this they use amazingly complex processes with scientific production controls and the latest equipment which fill buildings each a city block square and many stories high.

Reprints of this article, and all others in this series are available without charge. Please send your request to the Vitamin Division, Hoffmann-La Roche Inc., Nutley 10, New Jersey. In Canada: Hoffmann-La Roche Ltd., 286 St. Paul Street, West; Montreal, Quebec.

The watermills are gone. Today's needs require today's methods. How sensible it is that millers across the nation restore health-giving vitamins and minerals through enrichment.

*Webster's Merriam Collegiate Dictionary includes this definition of "enrich": "to improve (a food) in nutritive value by addition in processing of vitamins and minerals".

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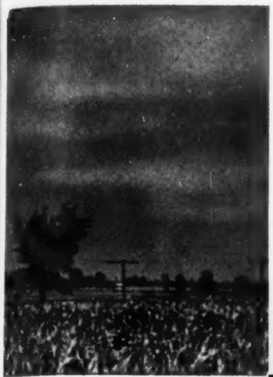

CEREAL SCIENCE today

FEATURES

TECHNICAL

DEPARTMENTS

STAFF

COVER: Dr. J. Ansel Anderson, tenth recipient of the Thomas Burr Osborne Medal — an award of the American Association of Cereal Chemists (see page 112).

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Editorial

WHAT IS THE VALUE of a scientific meeting? Members of scientific organizations and their employers are frequently confronted with this question and must decide whether or not the cost in time and money of attendance at such meetings is justified by the benefits derived. The A.A.C.C.'s Annual Meeting this month in San Francisco is a good example since the travel distance is relatively great for a large part of our membership.

All too frequently scientific meetings are looked upon by the layman as conventions held ostensibly for the exchange of scientific knowledge but actually more for the fun and entertainment provided. Nothing could be further from the truth. Meetings of all reputable scientific societies are packed with serious business, and concurrent technical sessions are usually necessary in order to complete the programs in a reasonable length of time.

At most scientific meetings, including our own, the subject matter of the technical programs is sufficiently diversified so that almost everyone in attendance will find reports of immediate interest to his own work. The opportunity we have to discuss these subjects in person with authorities in the field make it possible for us to obtain the full information we need and return to our work armed with new knowledge that will increase the effectiveness of our efforts.

Of perhaps even greater value is the opportunity presented at scientific meetings to discuss our own problems with others who have the same or similar ones. In informal group discussions it is common for each participant to contribute his small part, based on his own experience, to the clarification of the problem at hand. The piecing together of the experiences of the group frequently results in a much better understanding to the benefit of all concerned.

Although the practical value of the technical programs and informal discussions is usually sufficient to justify attendance at scientific meetings, there is another benefit greater than and above and beyond all else. It is an intangible something impossible to define, but that is experienced by nearly everyone who attends. It is in part the inspiration and stimulation obtained by associating with others having similar interests. In part it is the broadening of our scientific viewpoint and the rejection of narrow-minded ideas and points of view that have crept upon us unawares in the confines of our own laboratories or offices. It is a revival of our scientific spirit that sends us home with a new and clearer understanding of our duties and a new enthusiasm for creative accomplishment. A trip to San Francisco will give us this new enthusiasm.

Shall we see you there?

LAWRENCE ZELENY

INSTITUTION OF WIDESPREAD SERVICES

Canada's Grain Research Laboratory

By J. A. Anderson and T. R. Aitken*

Routine operations tend to gobble up research operations in any laboratory that is responsible for both. Separating these functions completely, sometimes even in separate laboratories, frequently helps solve the problem; but then the separation often goes too far, and the two functions fail to discipline each other.

The Grain Research Laboratory attempts to coordinate both types of work in one laboratory, limiting cannibalistic tendencies of the routine studies by striving for the utmost efficiency both in what is done and how it is done. Research is given pride of place, and "research work in relation to grain" is specified as the principal responsibility of the Laboratory in the Canada Grain Act, administered by the Board of Grain Commissioners, under which the Laboratory operates as one of a number of branches. While Grain Inspection is the largest of these branches, the Laboratory's service and control studies are, from the practical viewpoint, of more immediate importance to the Board and to Canada's grain trade. The research is directed towards the improvement of these studies, by seeking for a better understanding of what constitutes quality in various grains and how it can best be measured.

Responsibilities

This article will deal primarily with the scope and organization of the routine studies, since the results of all research are published, principally in Cereal Chemistry.

Briefly, the Laboratory's responsibilities are as follows:

To assess the quality of each new Canadian grain crop and make the information available in domestic and foreign markets;

Keep records of the quality of all grades of Canadian grain in all positions throughout each crop year;

Provide the laboratory services and cooperation required by the Board's Inspection Branch;

Collaborate with plant breeders in developing and testing new varieties of grain;

Serve as scientific consultants to the Board of Grain Commissioners;

Maintain liaison with other institutions working with grain; and

Serve as the main Canadian center for research relating to the quality of cereal grains.

Another "responsibility," related to the last named, stems from the fact that the Laboratory has been accredited by the University of Manitoba for postgraduate training of students, and by the National Research Council for continuing studies by postdoctorate fellows. The above listing does not necessarily place the responsibilities in order of importance, but it is a convenient sequence to follow in this article.

Framework of Operations

Never missing established deadlines, keeping on top of its analytical and technological work, and distributing information as soon as possible after it is assembled are achievements in which the Laboratory takes some pride. So many routine and technological tests are conducted annually that streamlined procedures must be followed from the time samples are received to final processing of diagrams, tables, and texts. As each sample is received, for example, notes on its origin, grade, bushel weight, unload point, reasons for grade, etc., are entered on an IBM punch card. This card becomes a permanent record; notebooks are not used. Cards follow samples around the Laboratory and results are added to them. Punching is done by the Laboratory, but mechanized sorting and tabulation services are provided by the Board's Statistics Branch. The system is remarkably flexible and can provide answers to questions about grades, bushel weights, and protein contents of Canadian grain in any position at any time; it speeds up the summarizing of data for frequency distributions, tables of means and ranges, maps, etc., used in the Laboratory's bulletins.

Maps and Reports

To provide information published in the Laboratory's Protein Maps, Crop Bulletins, Quarterly Cargo Bulletins, and Annual Report, three main series of samples are studied. Each fall, the Laboratory is responsible for distributing information on the quality of new crops of bread wheat, macaroni wheat, barley, and oil seeds, and the first series of samples is for this purpose. For bread wheat, some six or seven thousand individual samples, representing farmers' deliveries of new grain, are obtained from country elevator companies in such a way that the number of samples from each crop district across the prairies is proportional to wheat production in that district. In a sense, this is like taking a chemical Gallup Poll on crop quality.

The samples are analyzed for moisture and protein, and the data serve for making two Protein Maps, preliminary and final, that are given wide

*Board of Grain Commissioners, Grain Research Laboratory, Winnipeg, Manitoba.

distribution early in the season. These maps show the geographical distribution of the crop by four protein ranges. A Crop Bulletin, which discusses the protein data in greater detail, is released with the final map. When the samples have been collected they are composited to provide representative average samples of each grade, and these are subjected to comprehensive milling, baking, and analytical tests. The results are presented and discussed in detail in a second Crop Bulletin. Samples are collected and treated in much the same way for macaroni wheat, barley, flax, and rapeseed, and Crop Bulletins are issued on these grains. Information so obtained is also presented to the Western Committee on Grain Standards which meets in Winnipeg early in the fall, to "select and settle" standard samples of different Canadian grades for use during the crop year.

Throughout the whole of each crop year the Laboratory maintains records of the quality of grain moving from country points to terminals and to domestic and overseas customers. Detailed information on origin, destination, grade, dockage, etc., are kept on IBM cards, and all samples are analyzed for moisture, bushel weight, and protein content. At the end of the crop year, comprehensive studies of milling and baking (macaroni, malting, etc.) are made on composite samples made from individual samples. Maps, tabulated summaries, etc., for individual shipments and average samples are put on record in appendices in the Laboratory's Annual Report. Two further series of samples are used for these crop-year studies: one representing a systematic stratified sampling (5% to 20% depending on the class of grain) of carlots unloaded into mill elevators, terminal elevators, etc.; and a cargo series comprising samples from every parcel of every class of grain leaving the Lakehead and seaboard ports on the Pacific and Atlantic coasts, including Churchill on Hudson's Bay.

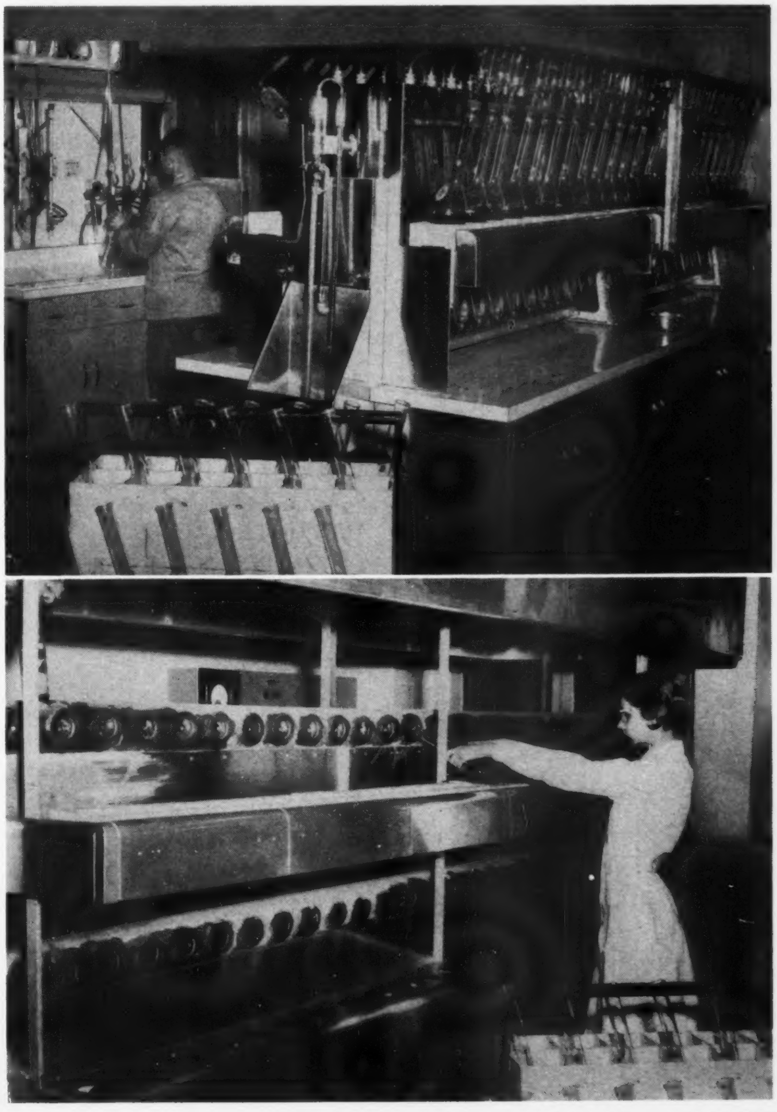
Last year, Quarterly Cargo Bulletins were introduced. Because of large carry-overs, information on new crop wheat is now of limited value to foreign buyers, who do not know when or in what proportion they will begin to receive new grain. The Quarterly Bulletins overcome this difficulty. Information is given on the average quality of all cargoes of each grade exported from Atlantic and Pacific ports during each quarter, as well as on moisture contents, bushel weights, and protein contents of individual cargoes. A comparison of data for succeeding quarters shows up any trend in quality, and it is generally possible to predict whether this trend is likely to continue. The bulletins are distributed by air through Canadian Government Trade Commissioners to buyers of Canadian wheat throughout the world. Processed by the offset photolithographic method, the bulletins are usually on the way within about a week after the data have been assembled.

As with the Quarterly Bulletins, other publications on current crops go out to those who want them, in the shortest time possible after the data are available. Crop Bulletins are processed on multilith plates, pages are printed by the lithograph duplicating process, and copies are distributed as soon as they are made into booklets. After the several painstaking steps that are involved in making up a protein map, the printer is supplied with a photo-etched plate made from an acetate base map containing Zip-a-tone hatchings corresponding to the protein ranges; then all he has to do is to make the plate for transferring this copy to a standard base map. In recent years, less than a week has been required from the last protein determination to the mailing of the maps.

Testing Wheat and Barley

Testing new varieties of bread

Top: protein laboratory, titration bench and distillation unit; bottom: digestor and cooling unit.



wheat, macaroni wheat, and malting barley developed by plant breeders is the last of the Laboratory's annual responsibilities. The Canada Department of Agriculture grows the new varieties side by side with standard varieties at a number of stations across the prairies. The Grain Research Laboratory collaborates in the testing of bread wheat and barley, but does all the testing of macaroni wheat. Milling, baking, and other quality tests are made on bread wheats; macaroni is processed from, and analyses are made on, durum wheats; and analyses of the grain, malts, and worts are made on barley. Every second or third year the Laboratory organizes collaborative trials in which institutions outside the country participate; these studies are invariably used before a decision is made on licensing and distributing a new variety. The Associate Committee on Grain Research of the National Research Council shares responsibility for interpreting these data. But the final responsibility for adequate testing of new varieties, and for sound advice on their quality to the Board of Grain Commissioners, rests with the Laboratory. Recent acceleration of breeding programs has given rise to the need for expansion of the whole program of variety testing, and this is now being undertaken.

General Services

In addition to the studies mentioned, the Laboratory does a considerable amount of work for the Board's Inspection Branch, the Canadian Wheat Board, and other organizations. As a broad generalization, it may be said that every type of damage to which Canadian grain is exposed, in the field or in storage, has been examined at one time or another in the Grain Research Laboratory. Moisture testing at all grain inspection offices across Canada is under the Laboratory's supervision. Operation of grain dryers is checked by quality tests on samples before and after drying, and in some years this is a round-the-clock operation. The Laboratory is also responsible for examining the effect on quality of treatments with insecticides, fungicides, and herbicides. Relations with the Inspection Branch are close, and all resources of the Laboratory are available to the Chief Grain Inspector at all times. Work for the Canadian Wheat Board generally relates to marketing of Canadian grain, and this often involves studies of competing products. Technical inquiries are of the order expected in any specialized laboratory, and many originate in foreign countries. The Laboratory always strives to make its facilities available to other organizations on request, and such cooperation, along with control and advisory services, is increasing every year.

The Protein Laboratory

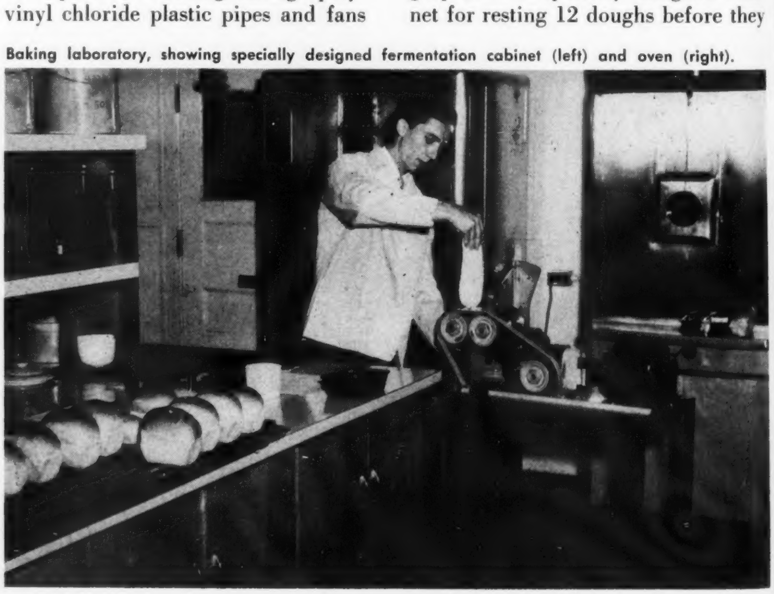
The "heart" of the Laboratory is its protein-testing facilities, where protein determinations are made on all samples. Seeing the protein laboratory is the only way to appreciate it; neither photographs (see the first two photos) nor even a lengthy description can do it justice. Efficiency is the keynote, and a considerable capital investment has been made to reduce labor costs and to take the drudgery out of the operation. Design and facilities of the laboratory are unique, and have been developed as a result of many years' experience in large-scale protein testing.

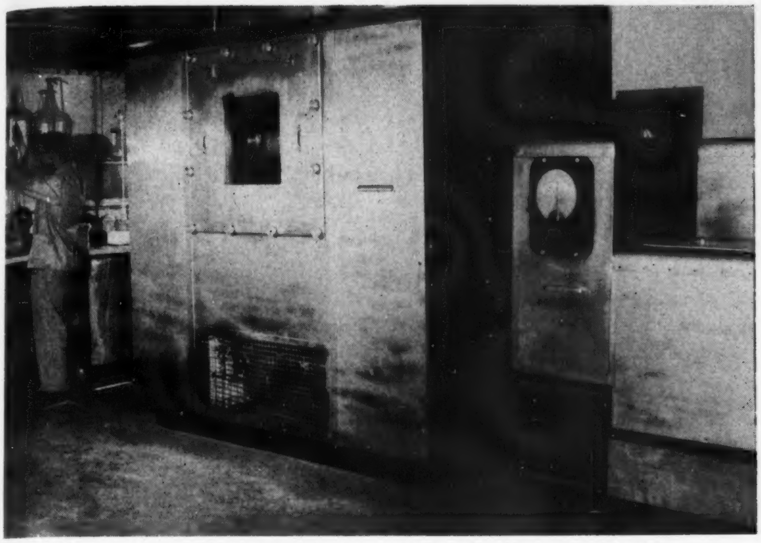
At full strength, the laboratory makes 480 determinations per day with four technicians, and has reached 720 tests in a long day to meet a deadline. About 60,000 are made each year. Large digestion and distilling units accommodate 48 flasks at a time, and an automatic timing device with a warning bell and light ensure uniform pre-set heating times. Fumes from the digestor are exhausted to the top of the building through polyvinyl chloride plastic pipes and fans to an outside stainless-steel stack, and excess heat from the distillation unit is drawn off through overhead cowling. A vacuum-pump system moves concentrated sulfuric acid from a large storage container to a dispenser for filling flasks, and centrifugal pumps transfer caustic soda solution to dispensers on both sides of the distillation unit. Push-button contact switches for both these operations are speed and safety features. Standard acid solution is pumped through polyvinyl chloride tubing from large to smaller containers over titrating benches. Caustic soda solution is prepared in large batches in black-iron storage tanks, and water required for this and other solutions is metered continuously rather than measured out in batches. For dilution of material in flasks, a manually operated semiautomatic dispenser delivers uniform charges of water. Samples for protein determinations are weighed at the rate of two per minute on a balance with the pan towards the operator. Catalysts are prepackaged in small plastic envelopes for rapid transfer to flasks, and flask dollies facilitate movement around the laboratory. Samples are ground and moisture is determined in the Sample Room near the protein laboratory.

The Baking Laboratory

The baking laboratory (below) is automatically controlled for temperature and contains up-to-date equipment for handling pup loaves; there are also a farinograph, an extensograph, and a specially designed cabinet for resting 12 doughs before they

Baking laboratory, showing specially designed fermentation cabinet (left) and oven (right).





Barley malting laboratory, showing germination cabinet (left) and steep tank (right).

are stretched. A good deal of the equipment was designed and, in several cases, was made in the Laboratory's workshop. Examples are the fermentation cabinet, which has closely controlled temperature and several unique operational features, and the dough mixer with a water-jacketed bowl which permits mixing in any gas or under positive or negative pressure; both have been described in detail in CEREAL CHEMISTRY. With its skilled staff, the baking laboratory is in constant operation throughout the year for routine and collaborative studies and for applied research. More than 3,000 flour samples a year are baked and studied for dough properties. The adjoining mill room is automatically controlled for temperature and humidity. Equipment is conventional and similar to that in many cereal laboratories. There are three laboratory mills; two Allis-Chalmers and one Buhler. Recently a small purifier, designed and built in the Laboratory, has been installed for sizing durum wheat semolina.

Equipment

Equipment for routine operations must continue uninterrupted from day to day, and breakdowns can be serious; hence the Laboratory operates on the principle that it cannot afford to have other than the best. First-class equipment reduces experimental error and makes for required levels of accuracy with minimum replication. Fully automatic equipment, too, permits round-the-clock operation with one rather than three shifts. Savings in labor costs, therefore, justify heavy investments in equipment such as the large cabinet on the left in the picture of the barley malting laboratory (above). Designed for studies of 15-lb. samples, this cabinet serves for the 6-day growing period, under controlled conditions, required for making malt, and combines features of the drum and compartment systems of pneumatic malting. Control of temperature, air flow, and timed intervals of drum rotation is automatic. Another example is the cabinet shown in the durum wheat lab picture, with other small-scale equipment for making macaroni (below). Its automatic controls drop the relative humidity stepwise in a preset pattern from 100% to about 60% during 28 hours by means of a relay system.

When suitable equipment is not on the market, it is designed and made in the laboratory workshop, or constructed locally to specifications and drawings prepared by the staff. The workshop is adequately equipped for maintenance and construction of equipment, and the top technicians have at their command the comprehensive range of skills required for this work. All drawings, photographic work, slide-making, and the like, for publications and lectures, are also done by technicians.

Research and Publications

Research at the Laboratory relates mainly to bread wheat and malting barley; work on macaroni wheat has recently been reduced and now engages a smaller proportion of research time, along with other miscellaneous projects. The research is "basic," in the sense that it drives steadily towards a better understanding of the scientific principles involved in grain quality, and "applied," in the sense that the knowledge currently achieved is used to deal with practical problems. With increasing use of scientific laboratory services in grain-processing industries throughout the world, the Laboratory must keep abreast of advances elsewhere and play its part in research, seeking a better understanding of cereal grains and their processing.

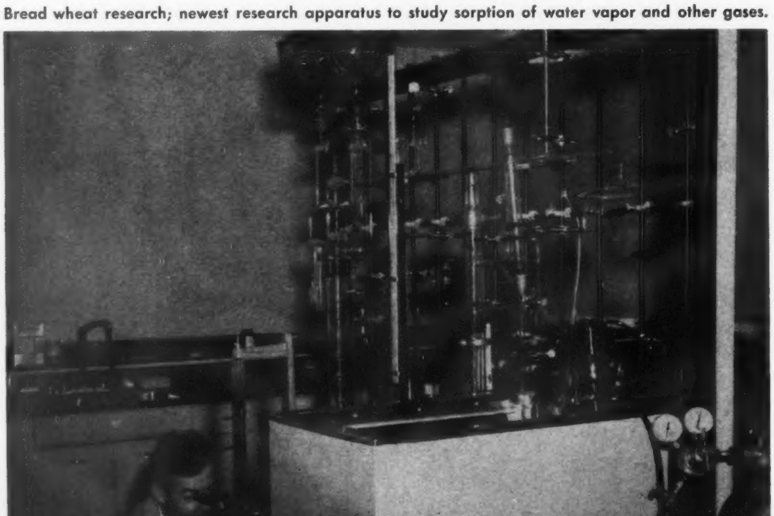
By the end of 1956, the Laboratory had published about 160 papers in the scientific literature, of which most

Durum wheat laboratory, with micro macaroni processing equipment; drying cabinet at the left, and extrusion press, rest press, and mixer at the right.

Bread wheat research; the relaxometer for studying relaxation of stress in doughs.

Barley research section; apparatus for studies of barley gums and enzymes.

Bread wheat research; newest research apparatus to study sorption of water vapor and other gases.



have appeared in CEREAL CHEMISTRY; summaries of research in progress are also published each year in the Laboratory's Annual Report. There is thus no need to give details in this article on the kind of research the Laboratory does; perhaps the photographs showing some of the specialized equipment will do as well.

A corner of the bread wheat research section is shown, to illustrate the GRL Relaxometer, a device designed and built in the Laboratory for measuring dough behavior in terms of meaningful physical properties. A newer model now being constructed will include refinements for measuring viscoelastic properties as a modulus-time distribution spectrum. Next is a bay in the barley research section devoted to work on barley gums and enzymes; and finally, the newest research apparatus (again in the bread wheat section), which will be used to study sorption of water vapor and other gases by wheat, flour, starch, gluten, etc.; these studies will apply the principle of surface chemistry to cereal grains and products. Further expansion of the Laboratory's research staff and facilities is in progress.

Beginnings and Progress

The Laboratory was established in 1913, principally to study the milling and baking qualities of different grades of Western Canadian wheat, to determine the effect of common types of damage on grain quality, to study the relation of moisture and the tendency of grain to heat, and to establish moisture limits for safe storage of grain. Its quarters were a few rooms of the upper floor of a small Government building in the suburbs of Winnipeg; staff was small, and equipment was primitive. In 1927 the Laboratory moved to the Grain Exchange Building where space and staff were both enlarged, equipment was modernized, responsibilities were increased, and supervision was placed directly under the Board of Grain Commissioners. How much the Laboratory's responsibilities have increased during the last decade or so can be realized by re-reading the earlier paragraphs outlining its present ones. Much of this expansion has occurred since the end of World War II.

The first chief chemist was the late Dr. F. J. Birchard, who retired in 1933. He was succeeded in that year

by Dr. W. F. Geddes, who resigned in 1938 to accept his present position at the University of Minnesota. Dr. J. A. Anderson, the present Chief Chemist of the Board of Grain Commissioners and Director of the Research Laboratory, succeeded Dr. Geddes in 1939.

The present staff should total 48, though there are two or three positions still to fill. Professional members include eight doctors and five other chemists. In addition, there are 29 technicians and an office staff of six.

An unusual location enhances the character of the Grain Research Laboratory—the large, eleven-story Grain Exchange Building in the very center of Winnipeg. Routine laboratories and general office are on the ground floor, and a suite of research laboratories and the Chief Chemist's office are on the eighth floor—its ivory tower. Periodic suggestions for a new laboratory building on the campus of the University of Manitoba have been steadily resisted. The belief is that close proximity to the Grain Inspection Branch and other divisions of the Board, and to the grain trade in general, helps the Laboratory to keep its feet firmly on the ground and to provide efficient and practical service to all. Visitors from within the building are frequent; everyone feels free to seek help and advice on technical problems. And a glance at the visitors' book will show that year after year the Grain Research Laboratory draws scientists and other grain experts from all over the world. All are welcome.

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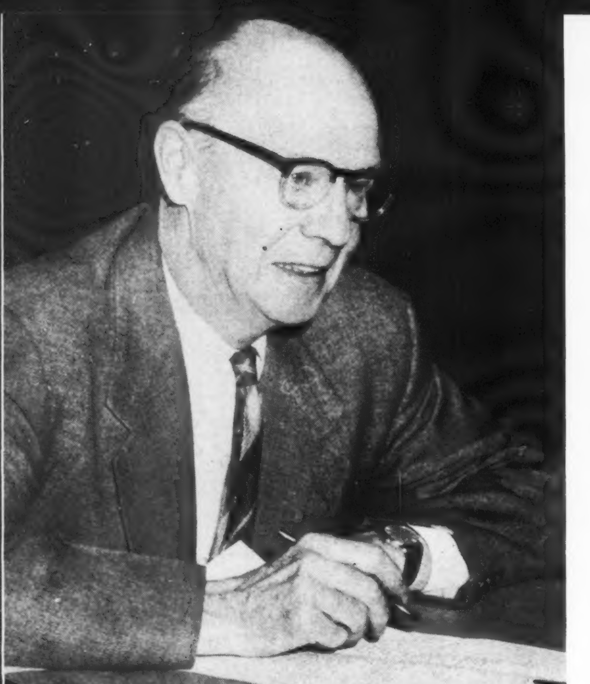
Editor's Note: Before readers assume the editorial staff has a crystal ball or operates like a weekly news magazine, a word of explanation is in order.

The above article was discussed with the senior author last May at the time the Grain Research Laboratory was undergoing remodeling. Last fall final arrangements were made and the manuscript scheduled for the May issue. As luck would have it, the Osborne Medal Award Committee selected a recipient for the first time in three years and by coincidence the individual chosen was J. A. Anderson.

After reading about a most excellent laboratory you'll be interested in learning something about the person who makes it tick.



Dr. J. Ansel Anderson, tenth recipient of the Thomas Burr Osborne Medal. The award will be presented at AACC's Fan Francisco meeting.

"For Distinguished Contributions in Cereal Chemistry"

1957

The American Association of Cereal Chemists will award its highest honor, the Thomas Burr Osborne Medal, to Dr. John Ansel Anderson, chief chemist of the Board of Grain Commissioners for Canada and Director of the Grain Research Laboratory, Winnipeg, Manitoba, during the Association's 42nd Annual Meeting, May 19-23, at San Francisco, California.

The award was founded by the A.A.C.C. in 1926 to recognize "distinguished contributions in the field of cereal chemistry" and was named after the outstanding protein chemist, Thomas Burr Osborne. The medal has been awarded only nine times previously during the 31 years of its existence. Other winners have been:

1928 Thomas Burr Osborne
1932 Clyde H. Bailey
1936 Morris J. Blish
1938 Charles O. Swanson
1942 Ross Aiken Gortner
1945 John C. Baker
1948 Betty Sullivan
1950 William F. Geddes
1954 Rudolph M. Sandstedt

Early Education

Dr. Anderson's interest in the cereal grains extends back to his early days in Alberta when he worked as a hired man on farms during the summer and attended the Olds School of Agriculture and later the University of Alberta during the winter. From the University of Alberta he obtained the B.Sc. in Agriculture in 1926 and the M.Sc. in Plant Biochemistry in 1928. His extra-curricular activities included debating (member of a team holding the interfaculty championship for three years) and work in the writers' club.

In 1928 he returned to England, where he was born in 1903 at Sidcup, Kent, for two years of study under Professor A. G. Perkin at Leeds University. He obtained the degree of Ph.D. in 1930 and spent part of the following summer studying microorganic analysis with Professor Fritz Pregl at the University of Graz, Austria.

Start of Research Career

Anderson returned to the University of Alberta in the fall of 1930 to pursue his research career with Dr. Robert Newton under a grant from the National Research Council of Canada. In 1931, when Dr. Newton was appointed director of the newly formed Division of Biology and Agriculture of the National Research Council of Canada, Anderson went with him to Ottawa. At the time he was working on the biochemistry of stem rust resistance in wheat. In 1935 he was given responsibility for developing a program of research on malting barley, and by 1939 a thriving research group had been developed. At that time he left to take his present position. His interests in cereal chemistry were thus broadened to include not only barley, but also bread wheat, macaroni wheat, and various minor crops.

Grain Research Laboratory

The Grain Research Laboratory's world-wide reputation as an outstandingly equipped and staffed cereal laboratory is no accident. The ability to select and train young men has enabled the A.A.C.C.'s medalist to develop a strong research team in Winnipeg. The laboratory is accredited to the University of Manitoba as a center for postgraduate research for the degree of Ph.D. In some sense the spirit and morale are more reminiscent of a university than of a government laboratory. One gains the impression that everyone is enthusiastically developing his own ideas and lines of research. Yet, the overall result is a coordinated rather than a scattered program.

To know Anderson's laboratory is to know the man, for it reflects his gift for organization and administration. He dislikes routine to occupy more than its necessary share of time.

To ensure this, the Grain Research Laboratory is equipped with automatic devices of every description to cut down on the time required for routine determinations and to increase their accuracy. About 50,000 samples are handled in the laboratory each year, including, for example, a sample from every parcel of grain exported by Canada. The protein section is equipped to make 480 Kjeldahl determinations a day, and with only four technicians. Routine records on individual samples are handled on IBM punch cards to facilitate rapid processing of the data published in the laboratory's new-crop bulletins, protein maps, quarterly bulletins on quality of exported wheat, and in its comprehensive Annual Report. Elsewhere in this issue readers will find the complete story of the laboratory and its work in the article entitled, "Canada's Grain Research Laboratory."

Personal Research

The personal research of Anderson has dealt mainly with malting barley, earlier in Ottawa and subsequently in Winnipeg. With W. O. S. Meredith as principal co-author, some 49 scientific papers have been published. Studies on bread wheats have been steadily expanded during his regime in Winnipeg, the main project being in cooperation with his associate, I. Hlynka. This work has dealt with the biochemistry of bread dough, and has involved rheological studies designed to provide quantitative measurements of the effects of bromate and other improvers on dough properties. Associated lines of analytical attack on the same problem have been made with D. K. Cunningham. Fifty scientific papers relating to bread wheats have been published since 1939.

A significant contribution has also been made to the biochemistry of durum wheats and the macaroni-making process. A kinetic attack, undertaken with G. N. Irvine, served to establish and elucidate the role of lipoxidase in destroying the yellow pigments during macaroni processing. Some 22 scientific papers have been published on this and related areas of durum research.

Contributions to the AACC

Members of the American Association of Cereal Chemists know "Andy" best for his personal contributions to the organization. He was made President-Elect in 1951, and succeeded to President the following year. He is an experienced writer, reviewer, and editor. His articles on the preparation of tables and graphs, on reviewing, on the use of statistics in scientific papers, and even on the art of writing itself are widely circulated. He was a member of the Editorial Board of CEREAL CHEMISTRY for six years, edited the A.A.C.C.'s first Monograph, "Enzymes and Their Role in Wheat Technology," and was co-editor with A. W. Alcock of the second Monograph, "Storage of Cereal Grains and Their Products." He was one of the first chairmen of the National Check Sample Service, and set up the system of reporting still in use.

Travel

Anderson's position with the Board of Grain Commissioners has given him ample opportunity to travel. Three years ago he was a member of a government mission to the Far East, visiting Japan, Indonesia, India, Pakistan, and various intermediate points. Last year, a long tour and two sets of meetings took him across the Atlantic three times and permitted visits to six European countries, the United Kingdom, and Eire.

His activities in Canada have centered around the Grain Research Committee of the National Research Council. This body has an overall responsibility for coordinating grain research in Canada; it also cooperates with plant breeders and pathologists in the production and testing of new varieties. Anderson was secretary of the Committee from 1943 to 1946, and chairman from 1946 to 1954. He is a Fellow of the Royal Society of Canada, a Fellow of the Chemical Institute of Canada, and more recently has been elected a Fellow of the Agricultural Institute of Canada in recognition of his services to Canadian agriculture.

In 1931, he married Miss Doune Scott of Edmonton. They have two sons, Garet and Jason. The family resides in Fort Garry, a municipality located south of Winnipeg.

Work is Hobby

When questioned about his hobbies he is apologetic, possibly repentant. He admits to gardening during five snow-free months, and claims that he specializes in bushes (because pruning is an art) and perennials to reduce the work. He is a student of philosophy, especially of the philosophy of science. In earlier days, he played golf regularly at around 90, but recently has found little time for it. Perhaps one could rightly say that J. Ansel Anderson is a man of wide rather than deep interests, more immersed in his work than anything else.

The Thomas Burr Osborne Medal — a gold medallion presented by the American Association of Cereal Chemists to distinguished scientists in the field of cereal chemistry. The relief is of Thomas Burr Osborne, the renowned protein chemist.

People, Products, Patter

. . . People

Raymond W. Albright, 62, vp and general manager of Distillation Products Industries Division of Eastman Kodak, died Feb. 19. A graduate of the University of Wisconsin, he worked with Goodrich Rubber from 1919 and later jointly with that company and Eastman Kodak in fabrication of rubber products. He became general manager of Distillation Products in 1944. He was a vp of the National Vitamin Foundation.

Harvie Barnard appointed to newly created position of director of Food Research for Roman Meal Co. of Tacoma, Wash.; will be in charge of product development and quality control for Food and Bakery divisions. Mr. Barnard most recently worked on liquid ferment process of baking and in-plant bulk handling of bakery ingredients for Clinton Corn Processing Co., Clinton, Iowa.

Donald K. Dubois named chief chemist at Harbor Beach, Mich., plant of Hercules Powder, which recently acquired the Huron Milling Co. at Harbor Beach.

Gladys A. Emerson, who has been head of department of animal nutrition at Merck Institute for Therapeutic Research in Rahway, N.J., has joined the faculty of University of California at Los Angeles, as home economics head; will continue as consultant for Merck.

John T. Goodwin, Jr., appointed technical director of Corn Industries Research Foundation, Inc., Washington, D.C.; will administer research and development programs sponsored collectively by companies in the corn refining industry. Has been manager of the chemistry division of Midwest Research Institute.

William H. Hale joins staff of agricultural research and development center of Chas. Pfizer & Co., Terre Haute, Ind.

James E. Henning appointed vp of Bjorksten Research Laboratories for Industry, Madison, Wis. **Irvin Leichtle** named administrative assistant.

Jasper H. Kane appointed to board of trustees at Adelphi College. He is vp in charge of research and development at Chas Pfizer & Co.

Norman Lazaroff named research project leader in newly organized group for studies in enzymology at Evans Research & Development.

Joseph A. McDonough joins process development staff of Procter & Gamble's research and development department.

James W. McLeod of National Starch Products, Inc., died suddenly on February 4, at the TAPPI convention, New York City.

John Meany named eastern field supervisor of the structural products division of National Starch Products, New York. **James Elf** named midwest field supervisor, Chicago.

A. C. Neish, associate research officer of Prairie Regional Laboratory, Saskatoon, Sask., will deliver the annual Merck Lecture at the 40th annual conference of the Chemical Institute of Canada in June.

Robert W. Shortridge appointed leader of newly established physical chemistry section of Midwest Research Institute, Kansas City, Mo.; has been directing a program in irradiation sterilization of foods.

Harry S. Walker completes military service and joins products research staff of Procter & Gamble's research and development department.

O. L. Yarham named technical sales representative in the Chicago area for the chemical products division of Archer-Daniels-Midland Co.

Benedict F. Zimmer, Jr., named technical sales and service representative for Fries & Fries, Inc., Cincinnati, with headquarters at the firm's New York office; formerly with Fritzsche Bros. as chief chemist of production and control, later with Albert Verley as chief chemist.

. . . Products

Catalin Molecular Model sets, used to construct three-dimensional representations of molecular structures, give a true representation of the chemical picture and provide a convenient means of demonstrating the phenomena. The eleven elements in their various valency states (hydrogen, carbon, nitrogen, phosphorus, oxygen, silicon, sulfur, fluorine, chlorine, bromine, and iodine), are colored according to British Institute of Physics recommendations, and designed to represent the three basic dimensions of the atom—bond length, bond angle, and spherical diameter. The atoms are machined from Catalin cast phenolic resin. The sets are available at laboratory supply houses or direct from the distributor, Arthur F. Smith Co., 311 Alexander St., Rochester 4, N.Y.

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The International Model HT, a table model high-speed angle centrifuge, has built-in safety by way of a heavy-gauge steel cabinet and guard surrounding the rotating head. Among several features that can aid materially in laboratory work are remote-control operation by way of a removable control panel with extension cords; complete instrumentation; self-balancing system; and air circulation system for cooling. It is distributed by the Chicago Apparatus Co., 1735 North Ashland Ave., Chicago 22.

• • •

Conditioning of wheat samples (6 to 17 lb.) enables the miller and cereal chemist to predetermine an optimum conditioning schedule. The redesigned MIAG Laboratory

Conditioner allows the application of the variable factors, temperature, time, and moisture, as well as vacuum. A rotating drum containing the wheat sample has electrically heated walls. The sample can also be heated and moistened by steam injection. Drum temperature and steam quantity can be accurately adjusted. Air of varying temperature and volume can be introduced into the drum for drying purposes. The vacuum-tight drum allows treatment under vacuum as well as under normal atmospheric pressure. Systematic test series can be conducted so as to establish the most suitable conditioning pattern for different wheat varieties. Grain other than wheat, and various other granular, nonsticky food and chemical products can be tested. (Miag Northamerica, Inc., 1616 South 8th St., Minneapolis 4, Minn.)

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The Beaumont Birch rotary feeder is a new, compact, periphery-sealed, 8-pocket rotary feed unit of the air lock type for feeding bulk chemicals and other materials into industrial processes at differential pressure to 25 p.s.i. Its mating, V-shaped, floating, Teflon seal rings extend service life considerably over previous models, and the outside adjusting screws permit adjustment of floating seals for maintaining a perfect seal without dismantling the feeder. Adjustable tips on the rotor blades are available in nylon, Teflon, neoprene, rubber, stainless steel, or monel; the tips can be adjusted for wear through a gasketed door without removing the rotor from the feeder. The unit, called the S.T.T. type, is available in 4,6,8, and 10-inch sizes combined with a new Reeves Vari-Speed Motordrive with ratios up to 10 to 1. Other types of constant or variable speed motors can be furnished. Write Beaumont Birch Co., 1505 Race St., Philadelphia, Pa., for additional details.

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Arthur S. LaPine & Co. will send data sheets describing several items of laboratory equipment: for laboratory water baths, a self-contained "Tempunit" that combines a heater, stirrer, and circulator with a built-in pneumatic control system and temperature indicator; and a new model portable cooler. Also a new line of insert-type polyethylene fittings and pipe for use with polyethylene sink traps. Arthur S. LaPine & Co., 6001 South Knox Ave., Chicago 29, Ill.

Typical installations of their bulk materials handling equipment are described in Bulletin 149 just issued by Sprout, Waldron & Co. One of the studies is that of a new installation in a central Pennsylvania bakery. Photographs and information about Pneu-Vac equipment in many other grain and feedstuff installations are included. Write to Sprout-Waldron Materials Handling Division, Muncy, Pa.

• • •

"Turbo - Convection" Ovens are designed for accurate heating in chemical processing and many other uses. Close heating-chamber gradients of $\pm$ 3° F. are achieved by a combination of full muffle-directed forced convection and recirculation, the fan construction, powerful fan motor, controller selection, and other features. The various voltages in AC and DC and the various phases are available, as well as extra power for heavy loads and fast heat-up. There are six standard models, ranging from 225° F. to 1000° F. and in heating chamber size from 4.75 c.f. to 27 c.f.

For further data and prices write L. & L. Mfg. Co., 151 8th St., Upland, Del. Co., Pa.

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A 12-inch pilot still, push-button controlled and operated, has an enclosed panel containing all necessary instruments, is simple to operate, and is shipped as a self-contained package unit needing only power and water outlets for immediate operation; capacity, up to 200 pounds per hour; self-cleaning, of stainless-steel construction throughout. For a bulletin describing its operation, with further information and prices for this and other models, write the manufacturer, Arthur F. Smith Co., 311 Alexander St., Rochester 4, N.Y.

. . . Patter

Roman Meal Co. of Tacoma, Wash., is making a substantial addition to existing laboratory facilities, for its expanded program in food research. Pliot-plant equipment will be installed for the development of new cereal products under this brand name, and there will be added facilities for product control and for technical service to Bakers of Roman Meal bread.

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Plans are well shaped up for the Millers' National Federation Convention May 15-17 at Hotel Drake, Chicago. One of the chief speakers will be Richard B. Heflebower of Northwestern University, on the subject of the price structure in the bulk product industries. Dr. Heflebower held a key position in OPA during the war period and has more than a casual knowledge of the problems of millers.

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A "Quality Development Forum" was an innovation on the program of the American Dry Milk Institute for its 32nd annual meeting, April 16-17, Chicago. It featured factual information and progress reports on research work under way at the Universities of Wisconsin and Minnesota.

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The Symposium on the Future of Food Preservation sponsored by the Midwest Research Institute (Kansas City, Mo., April 2-3) brought together in a single meeting speakers recognized for their knowledge on various aspects of food preservation, and gave a composite picture of technical developments, interpreting these in terms of their effects on the producer, distributor, and consumer. Papers and speakers for two of the sessions were: "Refrigeration and freezing," Daniel C. McCoy; "Dehydro-freezing," W. D. Ramage; "Dehydration," M. C. Brockmann; "Heat preservation," L. E. Clifcorn; "'High energy' preservation," Bruce H. Morgan; and "Chemical preservation," Hugh L. A. Tarr. In a third session, on food preservation methods, Robert B. Reese dealt with economics and William B. Esselen with nutrition; Ethel J. Russell discussed "The effects on the consumer."

• • •

The third edition of "The Chemical Industry Facts Book" has been published by the Manufacturing Chemists' Association. This is a 150-page basic reference work on the chemical industry; its 15 chapters range from "The industry's role in the economy" to such specifics as "Chemicals and nuclear energy." It is well illustrated with charts, graphs, and tables.

Past editions have been useful as aids to editors, educators, analysts, and others requiring detailed accurate information about the chemical industry, the announcement says. One of the book's principal uses should be in schools and colleges as a supplementary text and reference work. A 20-page Teacher's Guide prepared by John S. Richardson, president of the National Science Teachers' Association, is available free to educators with the book.

Single copy price is $1.25 prepaid; discounts on bulk quantities. (Manufacturing Chemists' Association, 1625 Eye St. NW, Washington 6, D.C.)

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The Corn Products Refining Co. will increase its manufacturing and packaging operations in the New York metropolitan and eastern markets by the acquisition of Refined Syrups and Sugars, Inc., who pioneered in the manufacture of liquid sugar and now produce liquid and granulated cane sugars for the baking, confectionery, beverage, canning, and other food industries. Corn Products, manufacturer of corn-derived syrups, oils, starches, and specialty products, recently observed its 50th anniversary.

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Several information leaflets of interest to nutritionists and others have been released by the New York Academy of Sciences, comprising reports presented at the Conference on Protein Nutrition sponsored jointly by the Academy and E. I. du Pont de Nemours & Co., Inc. Their titles are: "High protein guards health of children, studies show"; "African tribes may hold clues to heart disease and cancer"; "Report success in treating world's worst child disease" (kwashiorkor); and "Deodorized fish meal used to combat protein malnutrition." To obtain copies of these reports and further information, if desired, write the Academy's public-relations counsel: Medical & Pharmaceutical Information Bureau, 115 East 69th St., New York 21, N.Y.; attention Mr. Charles Burns.

American Association of Cereal Chemists

OFFICIAL REPORTS FOR 1956

ANNUAL REPORT OF THE TREASURER
JANUARY 2, 1957

The accompanying financial summaries represent an audited report of the Association's operations for the year 1956. While the assets of the Association show a decline of $6,000.00 during the year, the financial situation of the corporation remains sound, and prospects for a reversal of the downward trend in assets seem very good.

There has been a change in allocation of dues in line with a pending constitutional revision in order to meet the federal requirements for the mailing of our publications. Salaries for the Managing Editor and Secretary have likewise been reapportioned to more accurately reflect the amount of time devoted to their varied activities.

Income for 1956 was greater than budget expectations due to the following:

1. Net gain over budget in memberships of 69 actives, 14 sustaining, and one corporate ($565.00).
2. Convention surplus, 1955 and 1956 meetings, of $1,806.87.
3. Advertising income, $400.00 above budget.
4. Back issues and reprints, $270.00 above budget.
5. Subscriptions, $310.00 above budget.

Expenses for 1956 exceeded the budget as follows:

1. Contractual help and technical editing, $1,417.00.
2. Printing costs including mailing, approximately $4,000.00.
3. Office supplies, $717.00.
4. Nonrecurrent expenses connected with *Cereal Science Today* (promotion, printing for controlled circulation, layout, plates, etc.) $2,126.00.
5. Publication of two directories, $285.00; mimeographing Constitution, $120.00.

It appears that response to the new periodical has been very good. Both subscriptions (paid) and advertising have exceeded original estimates. A further increase of both advertising and subscriptions is anticipated, and another year should see this phase of our operations on a break-even basis, or possibly "in the black."

There were some unforeseen expenses connected with launching the new endeavor which have adversely affected the detailed operation statement of *Cereal Science Today*. However, this is no cause for alarm at this time. A further increase in advertising income should result in a balanced budget for *Cereal Science Today* by the end of 1957.

Respectfully submitted,
D. B. PRATT, JR., *Treasurer*

Results of Operations, 1956

Income:		
Memberships	$12,935.00	
Subscriptions	10,140.12	
Advertising (gross before commissions)	10,622.42	
Reprints	1,711.32	
Back issues	1,659.55	
Interest	627.80	
Surplus from annual meeting and reimbursement for expenses	3,578.93	
Miscellaneous publications income	137.38	
Monograph Vol. I	24.38	
Monograph Vol. II	1,791.78	
Decennial Index	150.80	
Cereal Laboratory Methods	19.30	
Total Income:		$43,398.78
Expenses:		
Printing	$17,699.75	
Reprints	1,430.89	
Salaries	14,787.96	
Office supplies	2,567.92	
Postage	2,084.66	
Advertising commission	2,598.92	
Circulation promotion (CST)	598.50	
Miscellaneous publications	1,224.98	
F.I.C.A. payments	189.18	
Miscellaneous A.A.C.C.	1,541.60	
Annual meetings	1,772.06	
Monograph, Vol. II	460.99	
Cereal Laboratory Methods	1,264.64	
Depreciation	290.07	
Total Expenses:		$48,512.12

Association assets, December 31, 1955			$29,304.75
1956 Income	$43,398.78		
1956 Expenses	48,512.12		
Decrease in surplus		5,113.34	
Reduction in Monograph inventory—181 books at $4.70		850.70	
Decrease in assets, 1956			5,964.04
Association assets, December 31, 1956			$23,340.71

Distribution of Surplus to Activities

Journals:			
Assets, December 31, 1955		$14,254.25	
Income 1956	$33,626.79		
Expenses 1956	37,375.54		
Operating deficit		3,748.75	
Assets, December 31, 1956			$10,505.50
Association:			
Assets, December 31, 1955		9,980.77	
Income 1956	$ 7,785.73		
Expenses 1956	9,389.40		
Operating deficit		1,603.67	
Assets, December 31, 1956			8,377.10
Monograph, Vol I:			
Assets, December 31, 1955		786.57	
Royalties 1956		24.38	
Assets, December 31, 1956			810.95
Monograph, Vol II:			
Assets, December 31, 1955		294.37	
Income 1956	1,791.78		
Expenses 1956	460.99		
Operating surplus		1,330.79	
Inventory, December 31, 1955 (634 books at $4.70)	2,979.80		
Inventory, December 31, 1956 (453 books at $4.70)	2,129.10		
Decrease in assets		850.70	
Assets, December 31, 1956			774.46
Decennial Index:			
Assets, December 31, 1955		$ 291.27	
Income 1956	$ 50.80		
Plus allocation	100.00		
		150.80	
Assets, December 31, 1956			$ 442.07
Cereal Laboratory Methods:			
Assets, December 31, 1955		3,697.52	
Income 1956	19.30		
Expenses 1956	1,286.19		
Operating deficit		1,266.89	
Assets, December 31, 1956			2,430.63
Total Assets, December 31, 1956			$23,340.71

Assets and Liabilities, December 31, 1956

Cash on hand:		
Checking account	$10,584.95	
Savings account	5,346.62	
Petty cash	319.00	
		$16,250.57
Current Liabilities:		
Balance due—Withholding taxes and Social Security	188.08	
Accounts payable—Social Security	52.18	
Dues received (1957)	8,674.00	
Credit on dues	12.00	
Subscriptions	5,369.07	
Cereal Laboratory Methods sales	3,933.20	
		$18,228.53
Cash position: (red)		$ 1,977.96
Accounts receivable (1954)	51.10	
Accounts receivable (1955)	115.33	

Accounts receivable (1956)	1,082.06	
Series G bonds	9,000.00	
Series F bonds	9,328.00	
Equipment	2,610.60	
Monograph inventory	2,129.10	
ASBC account	1,002.48	
		$25,318.67
Total Assets		$23,340.71

AUDITING COMMITTEE REPORT

The Auditing Committee, with the services of an expert accountant, has examined the books of the Association for 1956 and verify that the financial position as of December 31, 1956, as reflected by the Treasurer's report, is substantially accurate and presents fairly the position of the Association. The safeguarding of Association assets, including proper maintenance of accounting controls, is considered adequate. A detailed report submitted by the accountant has been forwarded to the Board of Directors.

F. A. Collatz, *Chairman*
C. G. Harrel
P. N. Leverentz

Report of the Managing Editor of Association Publications

The year 1956 has been an extremely active one for the publications staff. *Cereal Laboratory Methods*, 6th Edition, was completed and the publication date set for March 4, 1957. *Cereal Science Today* became a reality with six issues (Vol. 1) published by the end of the year. Beginning January 1, 1957, the new journal will be published monthly except June and August.

The work load imposed by the above two projects has been rather heavy and has taxed our limited staff and physical equipment to the utmost. Few members realize that when we speak of "our staff" we are talking about only *two* individuals. This basic full-time "staff" is supplemented by two *part-time* workers, one for clerical duties and one for editorial duties. The combined working time of both part-time individuals is *less than full-time*.

The preparation of 16 issues of a scientific journal plus the associated records, files, office machines, stencil plates, envelopes, etc. needed to service subscribers and advertisers should require about 800 sq. ft. of office space. However, the Association's combined business and editorial office is approximately 325 sq. ft. and *over one-third* of this space is used for storage of important AACC records and constantly used supplies.

The above is cited merely to illustrate the thin margin we have been working with during the past several years. To maintain a full-time professional staff to conduct the business of a growing organization such as ours requires a growing income. As the membership seeks more and more services in line with those being offered by other groups, costs rise. The AACC is attempting to adjust to this situation by publishing a journal of broad and popular appeal which will not only provide necessary and valuable information to our members, but will attract advertisers as well. Advertisers are willing to advertise *only* if they feel their message is being read by potential buyers. It is absolutely vital that every AACC member let his or her suppliers know that *Cereal Science Today* is read and liked by cereal chemists, and that the advertising, if properly prepared, reaches the right people and is read by them.

Those who have worked on *Cereal Science Today* during the past year are grateful for the many kind remarks received and the suggestions offered by so many of our members. We know that the journal isn't perfect but we feel that it is developing in the right direction. A good journal having loyal supporters will command a large number of advertisers. They will gain and we will gain by such an arrangement. This coming year is a critical one for our new journal. Our circulation must continue to expand from the excellent start it has already received. It is up to each of us to encourage our associates to read it and subscribe to it. Members of management, sales, quality control technicians — all will find something of interest. Let's tell them about it — today!

R. J. Tarleton

A.A.C.C. Representative to the American Association for the Advancement of Science

The new A.A.A.S. headquarters building at 1515 Massachusetts Avenue, N. W. Washington 5, D. C. was completed and occupied last year. It has attracted widespread and favorable comment. The Association now is in its 110th year with 53,000 members and 271 affiliated organizations.

The council has voted to endorse the proposed merger of the Association's two journals, *Science* and *The Scientific Monthly*. The new journal will have the format of *Science*, but much of the character of *The Scientific Monthly* will be retained in a special monthly issue. This issue will be devoted largely to review articles. The merger of the two journals will not take place before January, 1958.

The 1955 council's committee on the social aspects of science has published its report which has been publicized widely in newspapers and magazines. The report contains items of interest to many A.A.C.C. members. Copies may be obtained from Dr. Dael Wolfle, Executive Officer of the A.A.A.S.

Byron S. Miller

Audit for the New York Meeting

We certify that the receipts and expenditures of the Local Arrangements Committee have been examined carefully and that the report as submitted to the Treasurer appears to be correct.

E. L. Von Eschen, *Chairman*
R. T. Bohn

Employment

For many months the number of applicants and the number of openings listed with the Employment Committee have remained constant. As fast as an applicant located a new connection and withdrew from the list, another applicant took his place. Likewise, the list of openings has remained about the same.

At the present time there are nine applicants and twelve openings in the Committee files.

Strange as it may seem, only one beginner has appeared on the applicant list in nine years of this Committee's work. Most of the chemists requesting help have had at least ten years and many have had 25 years of experience. This situation leads one to wonder why.

It is apparent that beginners are in demand as evidenced not only by the Committee records but also by the abnormal rise over recent years in beginners' salary levels. Can it be that after a few years of experience, salary raises are not in proportion to the chemist's experience and initial pay; hence, the Committee is contacted for help? If this be true, then management should learn that green help is the most expensive help and start to reward experience.

Openings have for a long time exceeded the number of applicants. Most of these openings have demanded very specialized experience, thereby requiring time to find just the right chemist.

Why not write the Committee! You might be "just the right chemist."

ROWLAND J. CLARK, *Chairman*

Membership

During the last year the Committee continued the approach followed the previous year in which a record was set for new members. Application forms were made readily available from each Local Section officer. Periodically, those participating in local and national meetings are invited to join the national society. The Committee finds that many individuals who have been trained in related fields and whose work is related to baking and/or to feeds greatly appreciate the privilege of membership in this national society. In the coming year it is hoped that each member will keep handy an application form to pass on to non-member colleagues. Most of the sections have responded to the request that the annual membership list which is mailed to its members show the national members as (N) and the local members as (L), as the case may be. It allows each member to know who are not members and thus is in a position to invite his non-member friends to join.

Provision has been made to approve applications prior to registration at the San Francisco convention.

Over fifty applications have already been processed and considerably more are in the process of being approved. The actual number of new members for the year will not be known until September first.

HIRAM T. SPANNUTH, *Chairman*

Membership Application

During the period from July 1, 1956 to April 1, 1957 the Committee has approved 63 active memberships and 2 sustaining memberships. The countries represented outside the United States and Canada were one active membership each from Australia and The Netherlands.

CLAUDE F. DAVIS, *Chairman*

Nominating

Deadlines throughout the nominating procedure have been met due to the cooperation of all concerned. In line with constitutional directives, suggestions for suitable candidates for the offices of President-elect, Secretary, and Board of Directors were elicited from all Sections. Some Sections chose not to submit any suggestions. This is, of course, their right. It should be pointed out, however, that the Nominating Committee looks to the various Sections for guidance. It is hoped that in succeeding years Sections may exercise this privilege more vigorously than they have been doing in recent years.

Nominating ballot returns were gratifying—691 members participated in the balloting.

In the case of candidates for Board of Directors, the members were asked to vote for two this year. This was necessary to initiate the staggering of members of the Board in keeping with the By-laws. The latter provides that two members be elected by ballot—one in odd years, the other in even years—each for a two-year term. The Board of Directors has ruled that two members will be elected this year—one for a two-year term and the other for a one-year term with the candidate receiving the greatest number of votes elected to the two-year term and the candidate with the next largest number of votes elected to the one-year term.

FRANK R. SCHWAIN, *Chairman*

Professional Training and Education

The managing editor of *Cereal Chemistry* prepared, several months ago, suggestions for the make-up of a brochure designed to attract students into the cereal chemists' profession. Work was postponed temporarily, however, on the preparation of the brochure to permit the publications office to devote full time to the preparation of *Cereal Laboratory Methods*, 6th Edition. Now that *Cereal Laboratory Methods* is off the press, efforts can again soon be given to the preparation of the brochure.

The preparation of the brochure will be no easy undertaking because there are so many excellent brochures being published by various professional groups, each competing for the high school students' attention. Unless the A.A.C.C. brochure is attractive and unusually well done, it will probably not serve its purpose nor do credit to the Association.

Another consideration which must be definitely decided is how best to distribute the brochure in a manner to bring it to the attention of junior and senior high school students.

J. A. SHELLENBERGER, *Chairman*

Publicity

During the past year your committee has had the opportunity of following up on the New York meeting and initiating programs for San Francisco. The coverage of the New York gathering was excellent. All major trade publications and several of the leading scientific journals participated. A press room was established and proved worth while. Of the numerous photographs taken by the AACC's cameraman, many appeared in *Cereal Science Today* and others in publications throughout the country. The experience gained in 1956 will be put to use in 1957. The resulting continuity should be of great benefit to the local group in San Francisco.

W. J. SIMCOX, *Chairman*

Revision of Cereal Laboratory Methods

On March 4, 1957, the 6th Edition of *Cereal Laboratory Methods* came off the press. Unfortunately a number of copies were improperly bound and mailed before the error was detected. These have now been replaced at the binder's expense. The finished volume consists of 528 pages plus 18 pages of introductory material including the major index of the two indices provided.

The enormous task of checking the galley proofs for technical accuracy was carried out with the help of the

Technical Policy Committee, John A. Johnson, Chairman. The Editor would like to thank the members of the Advisory Committee, Betty Sullivan, George Garnatz, Frank Hildebrand, Eric Kneen, R. K. Larmour, and Frank R. Schwain for their help and guidance.

EMERY C. SWANSON, *Editor*

Osborne Medal Award

Dr. J. A. Anderson was chosen as the tenth recipient of the Thomas Burr Osborne Medal, by unanimous choice of the committee. The medal will be presented at the San Francisco meeting.

BETTY SULLIVAN, *Chairman*

TECHNICAL COMMITTEES

Technical Policy Committee

One of the purposes of the American Association of Cereal Chemists as put forth in The Constitution is to study analytical methods used in cereal chemistry and to develop and adapt uniform (or standard) methods of examination and analysis. The Technical Policy Committee has the responsibility of carrying out this objective. This committee formulates the policies and organizes the Technical Committees to study specific methods that are of value to cereal analysts.

During the past year, the chairmen of the various Technical Committees have given the Association valuable assistance in technical editing of the 6th Edition of *Cereal Laboratory Methods*, which will be a welcome addition to every cereal chemist's library.

Many new methods of analysis, which are the result of studies conducted by the Technical Committees, will be found in *Cereal Laboratory Methods*. Under the present operating policies, improvements in existing methods will be made and new methods will be developed. These methods will be published as they are approved and will be published in the next revision of *Cereal Laboratory Methods*.

Technical Policy Committee members are looking at ways and means to promote the use of standard methods of analysis. Many different methods for a given analysis may be found in the different cereal laboratories. This is neither helpful to a common understanding among industries nor to the professional status of the cereal chemist. It is the belief that a system of classifying methods as *official* or *tentative* might help bring a more nearly uniform application of methods by the cereal chemist. This system also should promote the recognition of the methods of analysis in buying and selling of cereal products and in legal courts concerning contracts. This system should assist in raising the professional status of cereal chemists.

With respect to future revision of *Cereal Laboratory Methods*, it would appear necessary to have committees critically examine the methods which appear in the 6th Edition. These methods should be classified as *official* or *tentative*. It may be that certain methods of analysis are obsolete and should be removed from the text. Others should be modified, and still others should be added. It would appear that the Technical Committees can do much for their association and professional status through continuous effort to improve analytical methods.

There are today 18 Technical Committees representing different areas of interest in methods of analysis of cereal and cereal by-products. These committees will present their results and recommendations at the 42nd Annual Meeting of the Association on Tuesday afternoon, May 21. It is hoped that all members of the Association will make contributions through open discussion of their common problems.

The reports which follow attest to the conscientious effort being made by many of the Technical Committees to carry out one of the main objectives of our Association—to develop and adapt standard methods of analysis.

JOHN A. JOHNSON, *Chairman*

Bran-in-Flour

The Bran-in-Flour Committee continues to investigate the possibility of determining bran in flour as a satisfactory method for measuring milling refinement. It is hoped that this method might be a better index of flour refinement in milling than the ash content of flour.

WILBUR L. DEATHERAGE, *Chairman*

Cake Flour

During the 1955–56 year, a scoring procedure developed in conjunction with the Prepared Mix Committee was tested by evaluating prepared mixes made with flours of widely divergent baking quality. The Committee as a whole was able to differentiate between the two flours with this scoring procedure; however, it was the consensus that the Committee work for further refinement of the scoring procedure during the 1956–57 year.

In line with the Committee opinion, the objectives for the 1956–57 year were established as follows:

1. Refine the 1955–56 scoring procedure to allow expression of small differences in grades.
2. Define in mathematical terms degrees of descriptive grades used to qualify such terms as crown of cake, shrinkage, and volume, so that these terms will be less subject to individual difference in interpretation.
3. Attach relative point values to various factors on the scoring sheet.
4. Test the revised scoring procedure again by baking and scoring, according to standardized procedures, prepared cake mixes made with flours of different baking quality.

The results received at the time of writing indicate that these objectives have been accomplished. A full report will be presented at the forthcoming Annual Meeting.

It is hoped that with a satisfactory scoring procedure at our command, the future work will again be directed toward the development of formulas and methods for the bake testing of cake flour.

JOAN M. HUBER, *Chairman*

Canadian Wheat Milling Procedure

The Committee activities during 1956–57 have been devoted to preparing a paper on variation in Buhler mills. The paper appearing soon in *Cereal Science Today* shows extreme variation in the various mills. This variation is associated primarily with the roll corrugations. A Buhler mill procedure is discussed.

W. J. EVA, *Chairman*

Cookie Flour

The Cookie Flour Committee has been continuing collaborative studies of the "A.A.C.C. Spread Factor Test for Cookie Flour." Efforts have been aimed at determin-

ing the causes of "uneven top-grain" in the baked cookies. A "no-milk" modification has been compared with the regular formula. An investigation also was made to reduce baking time by using elevated baking temperatures.

A report of the results of this study is being compiled and will be presented at the forthcoming 42nd Annual Meeting in San Francisco.

L. J. BRENNEIS, *Chairman*

Cracker Flour

This Committee has continued its study of the effect of flour aging on the quality of soda crackers.

Collaborative laboratory bread baking and commercial soda cracker baking tests were carried out each week over a three month period in the late fall of 1955 and again a year later in 1956. Commercial unbleached cracker flours milled from 1955 and 1956 wheat crops packed in paper bags were used in these tests. The chemical change due to air oxidation was only one of many complex changes occurring during flour storage. Other changes of biological origin, in particular those caused by enzymatic action from enzymes native to the flour and from bacterial sources, are believed to be responsible to a large extent for the desirable and undesirable effects due to aging. Variations in bacterial counts, gas production, temperature rise and pH of the commercial sponge as well as variations in the quality of the baked cracker as shown in volume, tenderness, bloom, pH and moisture were determined.

These properties, which were determined under commercial conditions showed fluctuations throughout the aging period. The greatest fluctuations in all of these properties in the sponge fermentation, baking and the baked cracker occurred during the fifth week of storage. These fluctuations can be described as flour instability, and were apparent over the first six weeks of storage. From the seventh to the thirteenth week of storage, the flour appeared to be in a fairly stable condition. However, even in the fifth week of storage satisfactory crackers can be baked if proper adjustments are made in fermentation, machining, and baking. Up to seven weeks aging, the flours have limited tolerance, that is, even slight changes in processing may cause variations in the quality of the finished product.

In processing, the changes brought about by the biological action of the multiple enzyme systems (from the flour bacteria and yeast) during mixing, fermentation and initial phase of baking exert a predominant influence on the quality and uniformity of the finished product. The bloom (browning effect) of the cracker was found to be the most important factor for evaluating the quality of the finished prduct. The laboratory baking test was only of limited value because commercial processing conditions contain many other variables which cannot be duplicated by the laboratory technique and, require constant supervision and adjustments by expert operators.

JAN MICKA, *Chairman*

Farinograph Standardization

Following publication in *Cereal Laboratory Methods* of two procedures for operation of the farinograph, as formulated by the Committee, it has logically become the Committee's responsibility to evaluate the constant flour weight and constant dough weight methods with the objective of proposing to the Association a single recommended procedure.

A collaborative study of the two methods, using 6 flours, involving both the large and small farinograph bowls, is now being completed. This will provide information concerning variability of individual methods, as well as an indication of differences in results to be expected between the methods. Information will also be procured concerning differences existing between various instruments when operated by carefully controlled common procedures. A report of this work and its implications will be presented at the National Meeting in May.

MAX MILNER, *Chairman*

Feed and Feedstuffs Evaluation

The Feed and Feedstuffs Evaluation Committee has not been active during the past year. Support of the Association has been given to the Association of Official Agricultural Chemists to study feed sampling methods. Numerous suggestions for future activity of this committee have been received and will be presented for discussion at the 42nd Annual Meeting of the Association in May.

E. F. BUDDE, *Chairman*

Flour Specification and Approved Methods of Analysis

The Committee held a meeting at Cincinnati, Ohio in February to consider flour specifications. The object of the Committee is to provide guidance to buyer and seller of flour regarding which specification should be included and to specify which method of analysis should be used.

The Committee recommends that moisture, ash, and protein are pertinent factors in white bread flour specifications. Moisture should be determined by the method 48.3; protein by method 67.1; and ash by methods 9.1a or 9.1b, *Cereal Laboratory Methods*, 6th Edition.

"Diastatic capacity", as a pertinent factor may be determined by method 34.1 using five hour total fermentation time or method 8.2, *Cereal Laboratory Methods*, 6th Edition. The two methods do not necessarily measure equivalent effects of malt alpha-amylase. Absorption and mixing characteristics of a flour are pertinent factors and should be determined with the farinograph using method 26.4, *Cereal Laboratory Methods*, 6th Edition. The use of a 300 gram sample is recommended. Dough development time and tolerance index should be expressed.

Color of flour, oxidation requirement, and microbial populations are pertinent factors and the committee is pursuing work to arrive at an objective test.

Bread making properties considered to be a pertinent factor should be described by one of the two methods, 11.2b or 11.2c, *Cereal Laboratory Methods*, 6th Edition.

GEORGE GARNATZ, *Chairman*

Hard Red Winter Wheat Experimental Milling

The committee membership on Buhler experimental milling procedure has now been increased to a total of seven. Our new member was added December 8, 1956. With this number our committee should have a more complete coverage of experimental milling activities throughout the winter wheat producing area.

As a project for 1957, our committee now is working on methods of improving systems of comparison, of experimentally milled flour, with commercially milled flour from the same wheat. Samples of wheat are now in the

hands of committee members for complete examination. As this project requires considerable detail, reports could possibly be delayed until later this year.

Greater interest in the automatic type of experimental mill is now being found among flour mills, wheat merchandisers, terminal storage elevators, and other groups, as evidenced by the number of mills installed during the past three years. Improved methods of procedure will be of particular interest to all of these groups.

C. R. HARLOW, *Chairman*

National Check Sample

The National Check Sample Committee has continued to provide the check sample service for members of the Association. Any member of the Association may subscribe to the service by writing the *Doty Technical Laboratories*, Box 7474, 1435 Clay Street, North Kansas City 16, Missouri. The results are analyzed monthly or bimonthly and reports made periodically to the subscribers of the service.

Check sample services available and costs are as follows:

	Description	*Fee per Annum*
A.	Monthly Hard Wheat Flour Sample For Ash, Protein, Moisture, Maltose, Gassing Power, Thiamine and Riboflavin.	\$6.00
B.	Bi-Monthly Hard Wheat Flour Sample For Ash, Protein, Moisture, Maltose, Gassing Power, Thiamine and Riboflavin.	4.00
C.	Bi-Monthly Soft Wheat Flour Sample For Ash, Protein, Moisture, Viscosity and pH	4.00
D.	Bi-Monthly Feed Sample For Protein, Fat, Fiber, Moisture, Ash, Calcium, Phosphorus, and other Special Analyses.	4.00
E.	Monthly Flour Sample For Sanitation Analysis.	6.00
F.	Bi-Monthly Flour Sample For Sanitation Analysis	4.00
HS.	Bi-Monthly Farinograph Sample — Small Bowl	6.00
HL.	Bi-Monthly Farinograph Sample — Large Bowl	6.00
I.	Bi-Monthly Amylograph Sample.	6.00

LESTER H. FISCHER, *Chairman*

Sanitation Methods

The Sanitation Methods Committee underwent a reorganization during the past winter when the resignation of its chairman, because of health reasons, made it necessary to select a new chairman and re-evaluate the work of the Committee. With the prospect of a shifting emphasis and the incomplete nature of the early-season work has been dropped. Current plans include a re-evaluation of the work of the Committee and the setting up of a program to divide this work into study units each of which can be completed during the Association's year. It is anticipated that extraction and counting procedures will be separately studied and that within these two broad categories there will be further breakdowns to distribute the work into sharply delineated areas of investigation.

The technical committee meeting at the national convention will continue along organizational lines in preparation for the technical work to be carried out during the coming year.

KENTON L. HARRIS, *Chairman*

Sedimentation Test for Wheat and Flour Quality

Two sets of flour samples each were distributed to 33 collaborators. Wheat was sent to those equipped to grind it into suitable test flour. For the others, the test flour was prepared from the allotted wheat samples by the laboratory of the Committee Chairman.

The first set was tested and reported on the "as is" basis. In the second set, the moisture content was purposely varied, ranging from 9% to 16%. Moisture was determined in each sample as tested and all results calculated to the 14% moisture basis, by means of the correction factors supplied in the "Sedimentation Test Instructions."

The results are not conclusive, but indicate that the factors are approximately correct. More detail concerning the sedimentation test will be presented at the 42nd Annual Meeting of the Association on May 21.

A. J. PINCKNEY, *Chairman*

Soft Wheat Experimental Milling Procedure

The activities of the Committee were limited this past year to a study of the report on tempering of the Hard Red Winter Wheat Experimental Milling Committee and investigation of the requirements for additional research on tempering of soft wheats for experimental milling. Future activities of the committee on tempering research will be decided at the San Francisco meeting.

E. F. SEEBORG, *Chairman*

Soybean Products

The joint A.A.C.C./A.O.C.S. committee, approved by the two technical societies, has been engaged in a collaborative study on a suitable method for the determination of urease activity in soybean products. This work has been completed recently, and a recommendation is being submitted to the Societies for their consideration.

It is probable that work for the coming year will involve a collaborative study covering the determination of protein solubility in soybean products.

L. R. BROWN, *Chairman*

Test Baking

During the past four years, the Test Baking Committee has worked diligently on the development of a sponge-dough method for test baking. This method is intended to supplement the straight dough method commonly used in many laboratories. The sponge-dough method approved by the Technical Policy Committee was published in the 6th Edition of *Cereal Laboratory Methods.*

Plans are being made to hold a committee meeting on the afternoon of May 21 at the 42nd Annual Meeting. All A.A.C.C. members interested in the sponge-dough method of test baking are urged to attend.

L. D. LONGSHORE, *Chairman*

Vitamins and Minerals in Enriched Cereal Products

The improved and simplified procedure for the determination of thiamine in cereal products, developed during the past four years, was approved by the Technical Policy Committee. It will be published in a forthcoming issue of *Cereal Chemistry* and the next revision of *Cereal Laboratory Methods.*

This committee is now engaged in a critical study of the methods for determination of riboflavin in cereal products. During the current year the study consisted of collaborative tests of the riboflavin content of a number of cereal products using fluorometric methods of the Association of Official Agricultural Chemists, the American Association of Cereal Chemists, and the Association of Vitamin Chemists. Results of these studies will be used to determine whether a revised method should be developed for riboflavin in cereal products.

W. G. BECHTEL, *Chairman*

STUDIES ON VARIANCE IN BUHLER MILLS, WITH A BIBLIOGRAPHY ON EXPERIMENTAL MILLING[1]

W. J. EVA, Chairman Canadian Wheat Milling Procedure Committee, The Ogilvie Flour Mills Co., Ltd., Winnipeg, Manitoba, and M. H. FISHER, Grain Research Laboratory, Winnipeg, Manitoba

EXPERIMENTAL MILLING IS an important phase of cereal chemistry. A number of mills have been especially designed for use in cereal laboratories, operating for the most part on the same basic principles as are employed in commercial mills but involving considerable manual work in the transfer of ground stock to sifters and of sifted stocks back to rolls. One of the first automatic mills for experimental work was that introduced by Buhler Brothers, of Switzerland, about 1935. This mill rapidly became very popular because with it almost any laboratory technician could become an experimental miller (of a sort). It is unnecessary to describe the mill because it is so well known and because it has been described in whole, or in part, so many times.

The science of cereal chemistry has made great strides in discovery of fundamental knowledge and in the development of techniques for assessing qualitative and quantitative factors. The standardization of approved chemical, physical, physico-chemical, and biological techniques for the determination of the quantitative factors has reached a rather high degree of perfection, and it is possible for cereal chemists to replicate, for the most part, one another's work with a high degree of accuracy. However, one of the most basic techniques in cereal chemistry, the production of flour in an experimental mill, has no degree of replication among different laboratories. At the present time it is not possible for laboratories to duplicate the work of one another on the same sort of wheat. It is unnecessary to stress the great urgency that exists for the development of a suitable procedure. The American Association of Cereal Chemists has had a Committee on Experimental Milling Procedure working on this problem since 1946. The problem was complicated because in some areas the laboratories worked exclusively with hard winter wheat, in others with soft winter, and in still others with spring wheat, and so on. In 1953 it was decided to split the committee into localized subcommittees, and in 1955 the subcommittees were raised to the status of full committees. One of these is now known as the Canadian Wheat Milling Procedure Committee and this paper is based upon the report of that Committee.

Preliminary Studies

At the outset, the Committee felt that difficulties were likely to be found in the characteristics of the mills and decided to concentrate its efforts in this direction. Accordingly, a questionnaire was sent to each collaborator, so that a complete picture of the physical characteristics of the mills could be available. At the same time, a detailed description of the milling procedure that was used was obtained for each mill.

The variations were large, and so were the differences in techniques. It was quite obvious that specifications for the setting of the mills, as well as a standardized procedure, would be required if uniform performances were to be expected. There were other factors, too, of which the Committee was aware, such as the condition of the rolls, but at the time of its first survey it had no way of either assessing or demonstrating them. Methods were found later, but before dealing with these it seems advisable to demonstrate the extreme difficulty, if not the utter impossibility, of preparing a standardized procedure that would make it possible for one laboratory to duplicate the work of another.

The data in the questionnaires on the physical characteristics of the mills and on milling procedures were used to prepare a set of specifications for the mills and a procedure for milling that would enable each of the operators to work in a closely similar manner, in a preliminary milling experiment. These specifications and the procedure are as follows:

Procedure for Setting and Operating The Buhler Experimental Mill

Roll speeds: Fast: 478 to 500
Slow: 245 to 251

Roll spacings: With dials disengaged, set 2nd and 3rd Break Rolls and Reduction Rolls to 0.1 mm. by means of feeler gauge. Set dials to 10. For milling, set break dials to 7 and 7; reduction dials to 3.5 and 1.5.

Sieve clothing:

1st Break	32W	10XX	
2nd Break	40W	10XX	
3rd Break	44W	10XX	
1st Reduction	36W	10XX	10XX
2nd Reduction	46W	10XX	10XX
3rd Reduction	. . .	10XX	10XX

(N.B.: 120D's in place of 10XX's in Mills Nos. 1 and 2.)

Milling procedure: Mill sufficient wheat to bring mill to operating temperature. Record this temperature. Clean mill out completely, including elevator and boots.

Tempering: Weigh out 2000 g. of wheat sample. Add prescribed amount of water. This is sufficient to give 16% moisture. Temper 18 hours. No scouring and no cleaning.

[1] Manuscript recevied September 26, 1956. This paper is based upon a report of the Committee on Canadian Wheat Milling Procedure, presented at the 41st annual meeting, New York, N.Y., May 1956.

Feed rate:	120 g. per minute. Test this by first using two or three 120-g. trial samples. These samples will form part of the milling. When Feed Rate is set, dump remainder of tempered wheat into hopper.
Clean-out:	Ten (10) minutes after wheat is through the 1st break, brush above and below Feed and Mill rolls and top sieve. Tap sifter with rubber mallet. Repeat performance after another 10 minutes. Run mill another 5 minutes.
Weighing:	Weigh and record fractions from each break and reduction and also Bran and Shorts. Weigh and record stock remaining in the boot of each elevator. Do not combine flours. Do not rebolt.
Chemical determination:	Determine and record moisture, protein, and ash on each of the Break and Reduction flours and Bran and Shorts. Determine fat and fiber on Bran and Shorts.

For the preliminary experiment, each operator was supplied with properly sampled portions of the same wheat (No. 2 Manitoba Northern), in sealed cans. As little as possible was left to the will of the operator; even the amount of tempering water was stated. The amounts of the various stocks as a percentage and on the basis of 14% moisture in all stocks are shown in Table I. The moisture, ash, and protein values are given in Tables II and III.

TABLE I

MILL YIELDS AS PERCENTAGES OF WHEAT BASED ON 14% MOISTURE IN ALL STOCKS

	Mill No.				
	1	2	3	4	5
	%	%	%	%	%
1st Break	8.8	7.3	5.7	6.8	6.1
2nd Break	7.0	10.8	8.0	10.5	8.4
3rd Break	2.8	5.7	2.9	3.0	2.4
Total break	18.6	23.8	16.6	20.3	16.9
1st Reduction	42.5	21.1	36.4	46.2	37.2
2nd Reduction	4.5	16.0	11.4	8.0	8.5
3rd Reduction	0.8	7.9	4.3	2.7	3.7
Total reduction	47.8	45.0	52.1	56.9	49.4
Total flour	66.4	68.8	68.7	77.2	66.3
Bran	24.0	19.2	19.2	18.2	22.3
Shorts	1.2	8.6	9.1	4.2	2.9
Total offal	25.2	27.8	28.3	22.4	25.2
Total recovery of flour and offal	91.6	96.6	97.0	99.6	91.5
Stocks remaining in boots of break elevator	1.7	0.8	0.5	0.1	1.2
Stocks remaining in boots of reduction elevators	3.4	1.3	0.9	0.4	3.2
Total	5.1	2.1	1.4	0.5	4.4
Total recovery	96.7	98.6	98.4	100.1	95.9
Milling loss	3.3	1.4	1.6	+0.1	4.1

The milling data are a most heterogeneous collection of figures. It is not possible to pick out two mills that give even reasonably good agreement in either the amounts or the protein and ash contents of the various stocks. Neither were there any signs of similarity for the two mills using Duraloy flour sieves.

Although room temperatures varied from 62° to 83°F., the temperatures of the mill stocks were relatively constant. This suggests that when the mills are brought up to their operating temperatures by a preliminary grinding period, reasonable variations in the room temperature are of minor significance. However, it does seem that the relative humidity of the room is of some importance. The relationship between the relative humidity and moisture content of stocks is difficult to interpret for Mills Nos. 2, 3, 4, and 5, but it is very clear that the low humidity surrounding Mill No. 1 is responsible for the low moisture values on the stocks from that mill. This point was studied further.

TABLE II

MOISTURE CONTENT OF MILL STOCKS, TEMPERATURE AND HUMIDITY DATA

	Mill No.				
	1	2	3	4	5
	%	%	%	%	%
1st Break	13.3	14.5	14.9	14.3	15.0
2nd Break	12.7	14.2	15.2	14.4	15.0
3rd Break	10.6	13.9	14.6	12.6	14.1
1st Reduction	12.8	13.9	15.1	13.9	14.8
2nd Reduction	10.4	13.5	14.1	12.0	13.8
3rd Reduction	7.3	12.9	13.3	10.5	13.4
Bran	13.8	13.1	15.3	13.9	15.2
Shorts	7.4	12.8	13.4	10.7	12.9
Room temperature, °F.	83	68	62	76	72
Room relative humidity, %	15	55	50	51	60
Temperature of mill stocks, °F.	74	77	73	73	78
Time of milling (min.)	43	42	42½	43	43

TABLE III

ASH AND PROTEIN CONTENTS OF MILL STOCKS

	Mill No.				
	1	2	3	4	5
	%	%	%	%	%
	Ash				
1st Break	0.50	0.47	0.45	0.46	0.45
2nd Break	0.43	0.60	0.50	0.47	0.45
3rd Break	0.58	0.63	0.77	0.83	0.60
1st Reduction	0.37	0.48	0.36	0.42	0.35
2nd Reduction	0.65	0.52	0.47	0.82	0.50
3rd Reduction	1.39	0.55	0.68	1.82	0.64
Total flour	0.44	0.52	0.44	0.53	0.42
Bran	4.52	4.99	3.61	4.97	4.84
Shorts	3.19	2.46	2.03	3.30	2.65
	Protein				
1st Break	13.0	13.9	13.9	13.9	13.8
2nd Break	14.8	15.2	15.3	15.5	15.6
3rd Break	16.9	15.5	17.2	17.6	17.1
1st Reduction	12.0	12.3	12.0	12.3	12.1
2nd Reduction	12.2	12.1	12.3	12.6	12.1
3rd Reduction	13.8	12.4	12.6	14.9	12.3
Total flour	12.6	13.2	12.9	13.2	12.9
Bran	16.3	17.4	16.2	16.7	16.3
Shorts	14.1	16.9	15.5	13.9	14.6

Effect of Relative Humidity

One of the collaborators (Mill No. 5) had facilities for controlling both temperature and humidity. The humidity control did not cover a wide range and, unfortunately, the range did not go as low as the 15% level recorded at Mill No. 1. However, it was possible to make duplicate millings at 45, 60, and 77% relative humidity (temp. 72°F.). The milling procedure was the same as that given in Table I. The data are shown in Table IV.

There is a marked increase in moisture content of all the stocks as the relative humidity goes up. There is also a definite trend toward lowered flour extraction as the humidity increases, and this is accompanied by a decrease in the ash content. This can be expected, because increasing humidity should lead to increasing toughness in the bran, which in turn would result in greater resistance to the pulverizing action of the rolls.

Operational vs. Mechanical Error

In the first studies, the five operators each worked on their own mills. Although specific instructions were given

on the *modus operandi* and the subsamples used were obtained by subdividing through a Boerner Mixer, the results were chaotic. The question arose as to whether, in spite of the detailed instructions, it was the operators, rather than the mills, who were at fault. To answer this question, arrangements were made for each of three operators to mill the same sample in each other's mills. For this purpose, one lot of wheat was subdivided into 18 subsamples and six of these were assigned to each mill. At each mill all the samples were milled on the same day.

Before each day's milling, the three operators together set the mills for roll spacing and feed rate and, in general, satisfied themselves that the three mills were set in accordance with specifications. It is important to record here that no dispute arose among the operators, which means that there were no special difficulties in following the instructions for setting the mills.

During the night before each milling, lamps were placed in the mills so that the rolls were near operating temperatures before millings were started and a pretest milling was made to bring the rolls to full operating temperature. To reduce variations due to sieves, one set of sieves was used for the three mills.

A somewhat different milling procedure from that outlined earlier in this paper was used. The differences, given below, appear only in the end stages of the milling:

The mill was blown out before starting. As soon as the break side had run empty, it was brushed down and the sifter tapped. The material remaining in the boots of the break elevators was collected and returned to the third break. When this material was through, the break system was again brushed down and blown down with compressed air, and the sieves were tapped.

When the reduction side became empty, the above scheme was followed, with the exception that the material in the boots was returned to the second reduction, the process repeated, and the material in the boots returned to the third reduction.

The stock finally remaining in the break and reduction elevator boots and any material hanging to the sieves was collected and recorded as discarded stock. Any flour remaining in the bottom of the sifter sections was brushed into the appropriate collection box.

TABLE IV

EFFECT OF RELATIVE HUMIDITY ON AMOUNTS OF STOCK, MOISTURE CONTENT, AND ASH CONTENT

	R.H. 45%		MEAN	R.H. 60%		MEAN	R.H. 77%		MEAN
	1	2		1	2		1	2	
	Percent of Total Flour								
1st Break	6.0	5.8		5.8	5.8		5.7	5.8	
2nd Break	8.6	8.4		8.0	8.0		7.9	7.9	
3rd Break	2.2	2.2		2.2	2.2		2.1	2.1	
Total Break	16.8	16.4	*16.6*	16.0	16.0	*16.0*	15.7	15.8	*15.8*
1st Reduction	39.2	39.1		38.6	38.2		38.5	37.7	
2nd Reduction	11.1	11.1		11.8	11.8		11.4	11.6	
3rd Reduction	5.0	5.1		4.9	5.3		5.0	5.5	
Total Reduction	55.3	55.3	*55.3*	55.3	55.3	*55.3*	54.9	54.8	*54.8*
Total Flour	72.1	71.7	*71.9*	71.3	71.3	*71.3*	70.6	70.7	*70.6*
Bran	20.9	20.9		21.0	21.0		21.5	21.5	
Shorts	5.3	5.6		6.0	6.1		6.4	6.4	
Total Offal	26.2	26.5	*26.3*	27.0	27.1	*27.0*	27.9	27.9	*27.9*
Total Recovery	98.3	98.2	*98.2*	98.3	98.4	*98.3*	98.5	98.6	*98.5*
	Percent Moisture								
1st Break	14.1	14.4		15.0	15.0		15.6	15.3	
2nd Break	14.1	14.5		14.8	14.9		15.4	15.4	
3rd Break	13.0	13.3		14.3	14.2		15.0	15.0	
1st Reduction	13.9	14.0		14.8	14.6		15.2	15.2	
2nd Reduction	12.6	12.9		14.0	14.0		14.6	14.7	
3rd Reduction	12.4	12.2		13.7	13.6		14.6	14.7	
Bran	14.4	14.7		15.3	15.4		15.5	15.7	
Shorts	11.9	12.4		13.7	13.8		14.8	14.8	
	Percent Ash								
1st Break	0.45	0.45		0.49	0.47		0.45	0.45	
2nd Break	0.46	0.46		0.44	0.44		0.44	0.44	
3rd Break	0.63	0.63		0.59	0.59		0.57	0.57	
Total Break	0.48	0.48	*0.48*	0.48	0.47	*0.48*	0.46	0.46	*0.46*
1st Reduction	0.36	0.36		0.35	0.36		0.34	0.34	
2nd Reduction	0.51	0.51		0.47	0.47		0.43	0.44	
3rd Reduction	0.66	0.66		0.62	0.61		0.56	0.57	
Total Reduction	0.42	0.42	*0.42*	0.40	0.41	*0.40*	0.38	0.38	*0.38*
Total Flour	0.43	0.43	*0.43*	0.42	0.42	*0.42*	0.40	0.40	*0.40*

TABLE V

DUPLICATE AND MEAN MILL YIELDS AND THE PROTEIN AND ASH CONTENT OF THE FLOURS

OPERATOR	FLOUR YIELDS						PROTEIN				ASH			
	Break		Reduction		Total		Break		Reduction		Break		Reduction	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%
	Mill No. 2 (Room temperature 64°–80°F.; relative humidity 40–51%)													
2	18.0	17.8	56.3	56.3	74.3	74.1	14.6	14.7	11.9	11.8	0.55	0.54	0.50	0.52
4	17.0	17.2	54.2	55.2	71.2	72.4	14.6	14.6	11.7	11.8	0.54	0.52	0.52	0.49
5	17.3	17.1	54.7	56.1	72.0	73.2	14.6	14.7	11.8	11.7	0.52	0.54	0.49	0.52
Mean	17.4		55.5		72.9									
	Mill No. 4 (Room temperature 74°–80°F.; relative humidity 53–58%)													
2	17.6	17.6	56.0	57.0	73.6	74.6	14.7	14.7	11.9	11.9	0.54	0.54	0.52	0.52
4	17.4	16.9	56.2	56.0	73.6	72.9	14.8	14.8	11.9	11.9	0.54	0.54	0.50	0.52
5	17.6	17.7	56.2	56.8	73.8	74.5	14.8	14.7	11.9	11.8	0.54	0.52	0.52	0.52
Mean	17.5		56.4		73.9									
	Mill No. 5 (Room temperature 72° ± 2°F.; relative humidity 60% ± 2%)													
2	16.4	16.4	52.6	53.4	69.0	69.8	14.5	14.6	11.7	11.7	0.47	0.47	0.42	0.42
4	16.4	16.5	52.8	52.5	69.2	69.0	14.5	14.5	11.7	11.7	0.48	0.48	0.43	0.43
5	16.1	16.2	52.8	52.3	68.9	68.5	14.5	14.5	11.7	11.6	0.47	0.47	0.41	0.40
Mean	16.3		52.7		69.0									
	Means for Operators													
2	17.3		55.3		72.6									
2	16.9		54.5		71.4									
5	17.0		54.8		71.8									

Each operator made duplicate millings on each Buhler Mill. The weights of individual stocks were recorded. Moisture determinations were made on the total break and reduction flours and on the offal. Protein and ash determinations were also made on the break and reduction flours.

When this experiment was first carried out and the results examined, all operators got noticeably lower amounts of reduction flour on Mill 2 than they did on Mills 4 and 5. Mill 2 had smooth rolls, whereas Mills 4 and 5 had frosted rolls. The smooth rolls were causing considerable flaking. Since there appeared to be no chance of making the machines duplicate each other as they were, the rolls of Mill 2 were frosted and the experiment repeated.

The milling values are summarized in Table V and the variances for total flour yields are analyzed in Table VI.

A preliminary examination of the data in Table V shows differences among operators and mills and also among the protein and ash values.

Variance analysis of total yields follows:

Analysis of Variance of Total Flour Yields

Variation due to:	*Degrees of Freedom*	*Mean Squares*
Mills	2	37.34**
Operators	2	2.24
Mills × Operators	4	0.81
Duplicates	9	0.27

** Significant at 1% level, when compared with mean squares for interaction of Mills and Operators.

The differences among the mills are highly significant, whereas differences among operators are not. Nor is the interaction between operators and mills significant when compared with the duplicate error. The experiment shows, therefore, that although operators can be expected to duplicate each other's technique, physical differences among the mills make it quite unlikely that replicate milling results can be obtained. Thus, no matter how carefully a set of milling instructions are drawn up and no matter how carefully an operator may try to follow them, the chances are very small of his duplicating the work of another operator using another Buhler Mill.

From the data in Table V, one could expect similar results from analyses of the variances in the ash and protein values. However, since a significant difference among mills has been shown with the yields, nothing is gained by laboring the point.

In this particular experiment, the same set of sieves was used in each mill. Thus, differences due to sieves could be ruled out. The swing of the sifters could have some influence; however, it was felt that the main troubles would be found in the rolls themselves. Accordingly, some stratagem was sought that would serve to illustrate, if not to measure, differences among the rolls of the three different machines.

Variations in Break Rolls

Photographs of plaster casts gave excellent pictures of the corrugations of the break rolls. Figure 1 shows the rolls on all the five mills used in the studies reported here, plus those of two other Buhler Mills. It takes but one glance to realize the tremendous differences there are in the condition of the various rolls. In addition to the variations that have occurred through wear, there appear to be variations due to differences in the original type of corrugation. Many of the cuts are sufficiently clear to measure the angles and in others a fair estimate can be made of what the angles were. These are given in Table VI.

The measurement of the angles and depths of cuts of the seven corrugated rolls presented many difficulties and the figures are at best only estimates. Wherever possible, three cuts on each roll were measured for the angles left and right of the vertical line through the bottom of the groove. Since these varied rather widely in most of the rolls, it is doubtful whether the average of the three angles really means much. However, since nothing better presented itself, the averages are also given. For the depth of cut, the best-fitting pair of parallel lines was drawn and the vertical height was measured and corrected for the degree of magnification in the photographs.

Since most of the mills have been used exclusively for Canadian hard red spring wheats (some soft wheats have been ground on Mills Nos. 3 and 6), it could be expected that although the amount of wear on the corrugations would vary, the type of wear would be the same. An examination of the profiles in Fig. 1 and the angles in Table VI strongly indicates, therefore, that the rolls did not start off with the same corrugations. The differences in the corrugations are apparently not only in the angles.

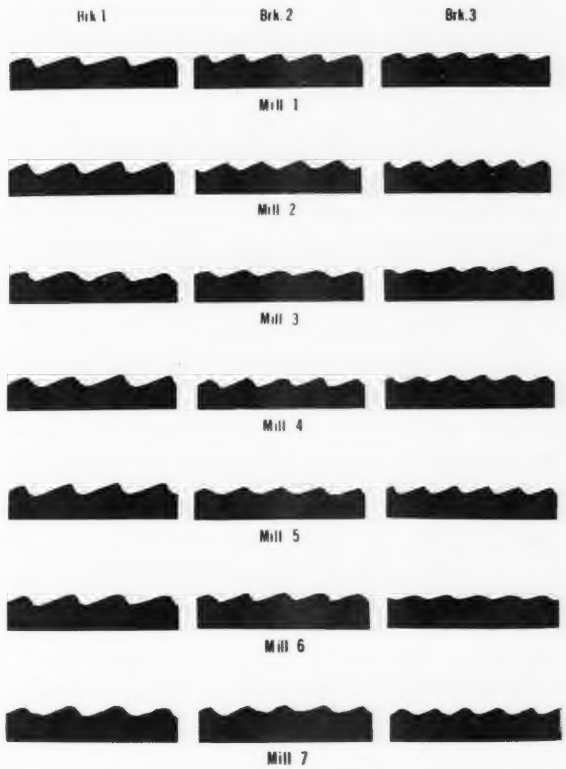

Fig. 1. Profiles of break rolls.

TABLE VI
CORRUGATION ANGLES AND DEPTHS OF CUTS

	Corrugation Angles								Depth of Cut
							Mean		
Mill No.	Left	Right	Left	Right	Left	Right	Left	Right	
	o	*o*	*o*	*o*	*o*	*o*	*o*	*o*	*mm.*
	1st Break rolls								
1	30	73	29	75	28	74	29.0	74.0	0.254
2	34	69	33	70	28	71	31.7	70.0	.305
3	45	71	45	67	40	78	43.3	72.0	.267
4	43	68	43	70	36	70	40.7	68.7	.308
5	32	69	25	71	28	74	28.3	71.3	.304
6	30	70	30	70	31	73	30.3	71.0	.304
7	..	69	41	69	43	72	42.0	70.0	0.267
	2nd Break rolls								
1	33	71	31	71	39	71	35.0	71.0	0.228
2	58	67	58	68	48	66	54.7	67.0	.254
3	56	72	55	74	61	74	57.3	73.3	.178
4	43	70	39	71	41	70	41.0	70.3	.228
5	61	72	57	73	48	74	55.3	73.0	.192
6	36	71	47	71	34	73	39.0	71.7	.228
7	70	64	59	73	47	77	57.3	71.3	0.192
	3rd Break rolls								
1	46	68	40	69	39	73	41.7	70.0	0.165
2	40	63	43	64	42	67	41.7	64.7	.216
3	51	68	46	70	44	72	47.0	70.0	.154
4	48	70	53	68	37	73	46.0	70.3	.154
5	41	66	38	72	35	71	38.0	69.7	.203
6	65	75	53	76	59	76	59.0	75.7	.114
7	58	69	41	70	48	66	49.0	68.3	0.203

Some of the rolls show evidence of having started with some "land" at the top of the cut (Nos. 1, 3, 6, 7) and others obviously started out with no "land" (Nos. 2, 4, and 5). The depth of cut also shows great variation. Although the actual amount of work done on each mill cannot be estimated, it is known that the rolls on Mill No. 2 have probably done the least amount of work and it is highly probable that the rolls in Mills Nos. 3, 5, and 6 have been used the most. These facts are in no way related to the values recorded for depth of cut.

The degree of hardness will have an important bearing on the wear, although it is difficult to see how this factor could be responsible for the wide variations that now exist in the angles of the cuts.

Thus, the study of the condition of the corrugated rolls leads to the conclusion that, no matter whether the variations are due to differences in the original cuts plus wear, or to wear only, the rolls in their present condition will have important differences in cutting and crushing action and cannot, therefore, be expected to replicate each other.

Variations in Smooth Rolls

The reduction rolls, too, are responsible for some of the variations in the milling characteristics of these mills. All the rolls in this series were frosted. It was pointed out earlier that the rolls on Mill No. 2 were originally polished smooth and that because they caused a considerable lowering in the amount of reduction flour due to excessive flaking of stock, they were frosted before the experiments were continued. This, in itself, is clear evidence of the futility of trying to develop a method that will give reproducible results on all Buhler Experimental Mills, since some have smooth and some have frosted reduction rolls. It now remains to be demonstrated that differences also exist among the frosted rolls themselves.

To illustrate the differences, a special flash camera was devised so that all rolls were photographed under exactly the same conditions. All the films were developed simultaneously, in the same tank, to eliminate variations in graininess due to development. Thus, the photographs in Fig. 2 (Mills 1, 2, 3, and 4) are truly comparable.

The rolls on Mill No. 2 are obviously much more frosted than are any of the others. These rolls were frosted by a Canadian company specializing in this work and not by the Buhler company. Whether this is the reason for the extraordinary difference, or whether it is due to the very little amount of wear this roll has had, is something that could only be determined by direct comparison with a new Buhler-frosted roll. However, even among the remaining rolls there are striking differences, and they cannot be expected to do the same sort of work.

Discussion

The conditions of the corrugated and frosted rolls in any set of Buhler mills are likely to be so different that the mills cannot be expected to replicate each other. This fact does not condemn the Buhler Mill as a useless piece of equipment. It is, indeed, an excellent tool in the hands of the experienced operator working within one laboratory. However, it was the duty of this Committee to develop a standardized procedure that would enable one operator to duplicate the work of another operator working with a different mill. Experienced operators can replicate each other in setting the Buhler Mill. There is no mechanical difficulty in ensuring that roll speeds and rate of feed are the same. The action of the sifter can also be controlled for speed and throw, although in this connection it is important to point out that a chain or gear drive would eliminate variations due to the belt slippage that is prevalent in present models. However, before Buhler Mills can be expected to replicate each other, they must have the same cuts on the corrugated rolls and the same type and degree of frosting on the reduction rolls.

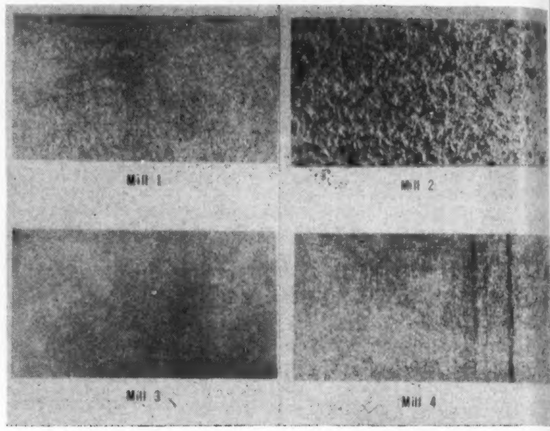

Fig. 2. Frosting on reduction rolls.

Such specifications can exist on new rolls and the manufacturer of the Buhler Mill is urged to pay very special attention to this factor. However, the rolls will change with wear, and sooner or later they will be too far away from the original specifications. It is quite likely that many thousands of pounds of wheat can be ground before the wear on the rolls will be sufficient to cause significant variations, and it may even be possible for the manufacturers to supply a set of profiles of rolls that are on the verge of becoming too far from specifications for reliable operation. Some such stratagem might well make the Buhler Mill not only useful within a laboratory but also useful between laboratories.

Although no references to previous work are given in this report, the Committee has gathered together a fairly extensive bibliography on the general subject of experimental milling and it has been felt that it would be useful to publish this bibliography as an appendix to this report. The references are essentially restricted to literature describing experimental mills and their operating procedures, techniques for using laboratory grinders and other such artifices for producing a flour, comparisons among different types of experimental mills, and reports of previous A.A.C.C. Committees on Experimental Milling.

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BIBLIOGRAPHY ON EXPERIMENTAL MILLING

Anderson, J. E. Comparison of experimental and commercial milling results. *Northwestern Miller* (Prod. No., Aug.) *10:* 48–53 (1938).

Anderson, J. E. The Buhler Mill. *Northwestern Miller* (Production Number, Oct.) *12:* 34–36 (1938).

Anderson, J. E., and Bayfield, E. G. Survey of experimental milling methods. *Trans. Am. Assoc. Cereal Chemists 1:* 29–37 (1943).

Bailey, C. H., and Markley, M. C. Correlations between commercial and laboratory milling tests. *Cereal Chem. 10:* 515–520 (1933).

Baker, H. W., and Gregory, N. L. Some preliminary studies pertaining to the operation and use of the Buhler Mill. *Cereal Chem. 19:* 267–279 (1942).

Barbade, P. La determination de valeur boulangère des blés. *Ann. Fals. 27:* 476–485 (1934).

Barbade, P., Pisani-Borg, L., and Duval, J. Contribution à l'etude de la qualité des blés et farines. Imprimerie de Publications Periodique: Paris (1935).

Bayfield, E. G. Report of the Federal Soft Wheat Laboratory, 1937 Crop. U. S. Dep't. Agr., Bureau of Plant Industry, Wooster, Ohio. Unnumbered Mimeo. Pub. (June 1940).

Bayfield, E. G., Anderson, J. E., Geddes, W. F., and Hildebrand, F. C. The effect of mill room temperature and relative humidity on experimental flour yields and flour properties. *Cereal Chem. 20:* 149–171 (1943).

Bayfield, E. G., and Heizer, H. K. Second Annual Report of the Federal Soft Wheat Laboratory, 1938 Crop. U. S. Dep't. Agric., Bureau of Plant Industry, Wooster, Ohio. Unnumbered Mimeo. Pub. (August 1940).

Binnington, D. S., and Geddes, W. F. Experimental durum milling. *Cereal Chem. 13:* 497–521 (1936).

Blish, M. J., and Sandstedt, R. M. Factors affecting the interpretation of the experimental baking test. *Cereal Chem. 4:* 291–299 (1927).

Bottomley, R. H. A comparison of Brabender experimental and commercial mill flours with special reference to their diastatic activity and gassing power value. *Cereal Chem. 20:* 669–678 (1943).

Cayzer, L. S., and Jones, L. Is experimental milling reliable? New South Wales Dept. Agr., Misc. Pub. 3, p. 159 (1938).

Finney, K. F., Heizer, H. K., Shellenberger, J. A., Bode, C. E., and Yamazaki, W. T. A comparison of certain physical, chemical, and baking properties of commercial Buhler and Hobart milled flours. *Cereal Chem. 26:* 72–80 (1949).

Finney, K. F., and Yamazaki, W. T. A micro-milling technique using the Hobart Grinder. *Cereal Chem. 23:* 484–492 (1946).

Fisher, M. H., and Meredith, W. O. S. Note on a semi micro milling procedure for durum wheat. *Cereal Chem. 23:* 565–568 (1946).

Geddes, W. F., and Aitken, T. R. An experimental milling and baking technique requiring 100 grams wheat. *Cereal Chem. 12:* 696–707 (1935).

Geddes, W. F., and Aitken, T. R. The comparative quality of flours from corresponding wheats milled on an Allis-Chalmers Experimental Mill and a Brabender Automatic Laboratory Mill. *Cereal Chem. 14:* 511–524 (1937).

Geddes, W. F., Bergsteinsson, H. N., and Hadley, S. T. Variability in experimental baking. III. The influence of experimental milling in evaluating wheat strength. *Cereal Chem. 10:* 555–559 (1933).

Geddes, W. F., and Frisell, B. An experimental mill for 100-gram wheat samples. *Cereal Chem. 12:* 691–695 (1935).

Geddes, W. F., and West, H. E. A statistical study of the reliability of experimental milling tests. *Sci. Agr. 10:* 333–343 (1930).

Harris, R. H. Variability in preferred methods and results of Buhler Mill operations. *Trans. Am. Assoc. Cereal Chemists 8:* 15–28 (1950).

Harris, R. H. A comparison of results from preferred and specified methods in Buhler milling. *Trans. Am. Assoc. Cereal Chemists 8:* 190–196 (1950).

Harris, R. H. Uniformity of results obtained from a set procedure of Buhler milling. *Trans. Am. Assoc. Cereal Chemists 10:* 67–73 (1952).

Harris, R. H., MacKenzie, J. M., and Seeborg, E. F. Further studies on the utility of the Buhler Experimental Mill. *Trans. Am. Assoc. Cereal Chemists 11:* 182–195 (1953).

Harris, R. H., and Sanderson, T. A comparison between the Allis-Chalmers and micro-milling techniques on North Dakota hard red spring wheats. *Cereal Chem. 16:* 619–625 (1939).

Hite, E. B. Experimental milling. Bull. Assoc. Operative Millers, pp. 1050–1054 (1940).

Johnson, J. A., Jr., and Swanson, C. O. The testing of wheat quality by recording dough mixer curves obtained from sifted wheat meals. *Cereal Chem. 19:* 216–229 (1942).

Jones, C. R., and Fisher, E. A. Model test milling: A study of its technique and its place in flour milling research. Research Assoc. British Flour Millers, Confidential Rpt. No. 9 (1928).

Kranz, W. Herstellung von Weizenmuhlen auf der Versuchsmuhle. *Muhlenlab. 4:* 61 (1934).

Kranz, W. Vereinfachte Versuchsmühlerei zur Weizenqualitätsprüfung. *Muhlenlab. 5:* 101–104 (1935).

Lamb, C. A. Sifted wheat meal mixograms for selecting soft wheat flours. *Cereal Chem. 21:* 57–64 (1944).

Leatherock, L. E., McGhee, H. W., and Giertz, J. W. Diastatic activity in connection with flour mill control. *Cereal Chem. 14:* 161–181 (1937).

Markley, M. C., and Bailey, C. H. Factors affecting the diastatic activity of wheat flour. *Cereal Chem. 11:* 515–522 (1934).

Markley, M. C., and Treloar, A. E. The influence of individual milling technique on flour and loaf characteristics. *Cereal Chem. 14:* 305–315 (1937).

McCluggage, M. E. The determination of moisture requirements for tempering wheat for experimental milling. Bull. Assoc. Operative Millers, pp. 962–963 (1939).

McCluggage, M. E. Micromilling and baking of small samples of wheat. *Cereal Chem. 20:* 185–193 (1943).

McCluggage, M. E., Anderson, J. E., and Larmour, R. H. A comparison of the Allis-Chalmers and the Buhler automatic experimental mills. *Cereal Chem. 16:* 610–619 (1939).

Miller, E. S. The purpose of experimental milling. Bull. Assoc. Operative Millers, p. 838 (1937).

Mueller, G. Eine neue Laboratoriumsmuhle — der Mehlautomat. *Muhlenlab. 4:* 141–146 (1934).

Mueller, G. The new Brabender automatic laboratory mill. *Flour Problems 9:* 78–80 (1935).

Naszály, N. Etude sur les qualités plastique de la pâte. *Bull. Anciens Elève de l'Ecole Française de Meunerie 38:* 99–101 (1935).

Ostwald, W., and Steinbach, O. Beitrage zur Kenntniss der Muhlgange. *Z. ges. Getreidew. 15:* 72–77 (1928).

Pascoe, T. A., Gortner, R. A., and Sherwood, R. C. Some comparisons between commercially and experimentally milled flours. *Cereal Chem. 7:* 195–221 (1930).

Scharnagel, Th. Bedeutungsvolle Zusammen hänge Zwischen der Mahl- und Bachfahigkeit verschiedener Weizensorten. *Z. ges. Getreidew. 22:* 13–24 (1935).

Seeborg, E. F. A modified flow sheet for Buhler mills. *Northwestern Miller 241* (2): 1a, 21a–22a (1950).

Seeborg, E. F., and Barmore, M. A. Suggestions for improving the uniformity of Buhler experimental milling. *Trans. Am. Assoc. Cereal Chemists 9:* 25–30 (1951).

Seeborg, E. F., Shoup, N. H., and Barmore, M. A. Modification of the Buhler Mill for micro milling. *Cereal Chem. 28:* 299–308 (1951).

Sibbitt, L. D., Scott, G. M., and Harris, R. H. A further comparison of flours obtained with the micro and Allis-Chalmers mills. *Cereal Chem. 20:* 679–685 (1943).

Sullivan, B. Quick tempering of wheat for experimental milling. *Cereal Chem. 18:* 695–696 (1941).

Swanson, C. O., and Kroeker, E. H. Testing wheat varieties for milling and baking quality. *Cereal Chem. 9:* 10–33 (1932).

Willard, J. T., and Swanson, C. O. Milling tests of wheat and baking tests of flour. Kansas State Agr. Coll., Bull. 177 (1911).

Ziegler, E. Versuchs mit der Buhler automatischer Laboratoriumsmuhle. *Z. ges. Getreidew. 25:* 222 (1938).

Ziegler, E. The use of a purifier in experimental milling. *Cereal Chem. 15:* 663–671 (1938).

Ziegler, E. The effect on diastatic activity of surface, pressure differential and temperature of the reduction rolls in grinding. *Cereal Chem. 17:* 668–679 (1940).

SOME EFFECTS OF GAMMA IRRADIATION ON THE BIOCHEMICAL, STORAGE, AND BREADMAKING PROPERTIES OF WHEAT[1]

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IT HAS FREQUENTLY been suggested that grain might be treated with ionizing radiations to control or eliminate insect infestation (4). Little thought has been given, however, to the possible effects of such treatment on the technological properties of the grain, nor have any investigations been made concerning the possibility of using radiation to control storage fungi, principally of the Aspergillus group, that are the primary cause of respiration and heat production in damp stored grain (1). This possibility would be based on the known destructive effects of radiation on various biological species and materials as summarized in Fig. 1. Only very recently have reports and publications on the properties of flour treated with gamma radiation appeared (2, 3, 5).

The Department of Flour and Feed Milling Industries has begun investigating the utility of gamma-irradiation treatment to inhibit fungal respiration in damp grain as a possible way to lengthen storage life. Also studied were the effects of such treatment on some of the biological, biochemical, and technological properties of wheat, which would concern millers and bakers. This contribution is a condensation of two papers recently published in *Food Technology* (6, 7), based in part on an M.S. thesis by Mr. Yin-Chao Yen.

Irradiation of Damp Wheat

One objective was to determine the effect of gamma irradiation on the respiratory activity, viability, alteration in fats and proteins, and the development of browning intermediates in a sound sample of wheat of high quality dampened to 20% moisture content. Samples of such grain immediately after conditioning were frozen in metal respirometers, packed in dry ice, and shipped by express to the Brookhaven National Laboratory for gamma-radiation treatment at various levels. A number of biological and biochemical tests were performed on the samples when returned as well as on the same material maintained in respirometers for 17 days at 30°C.

The respiratory trend in these samples over a 17-day period is shown in Fig. 2. This graph indicates that when the radiation applied was insufficient to destroy fungi (0, 25,000, and 125,000 rep[2]), the respiration pattern reflected the development of molds in damp grain. Treatment with 625,000 rep or with higher dosages caused decreased respiratory activity, indicating the damp grains to be essentially sterile as far as fungi are concerned. Storage fungi seem to have been eliminated by such treatments. Respirator quotient (R.Q.) data for the three similar treatments, which did not sterilize (0, 25,000, and 125,000 rep), showed the typical pattern associated with

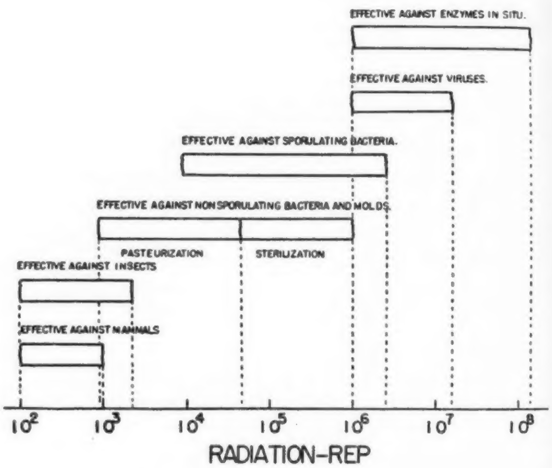


Fig. 1. Ionizing radiation levels required for various biological effects.

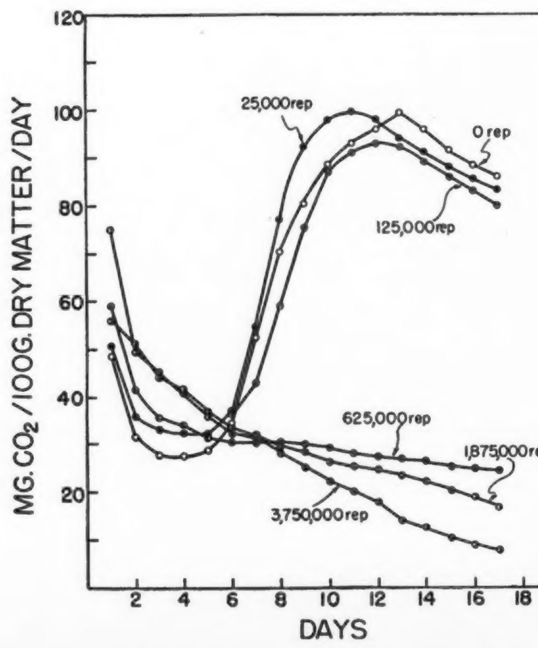


Fig. 2. Influence of gamma-radiation dose and time on the respiration of damp wheat (20% moisture) at 30°C.

[1] Manuscript received January 11, 1957. Contribution No. 283, Department of Flour and Feed Milling Industries, Kansas Agricultural Experiment Station, Manhattan. Presented at the Tri-Section Meeting, A.A.C.C., Manhattan, Kansas, October 5-6, 1956.

[2] Roentgen equivalent physical.

fungal growth (R. Q. of 1.0 to 0.8), whereas the sterilized grain exhibited sharp elevations in R. Q. to values as high as 2.5.

Significant biological and biochemical changes were promoted by the radiation treatment as well as by the subsequent 17-day period of storage. As indicated in Table I, germination, originally 96%, was reduced seriously by radiation levels as low as 25,000 rep, and fell to 10% with 125,000 rep of exposure. Treatments above this level completely eliminated seed viability. At radiation levels too low for mold sterilization (0, 25,000, and 125,000 rep) the toxic effect of developing fungi further reduced the remaining germination count.

TABLE I

INFLUENCE OF GAMMA RADIATION ON BIOLOGICAL AND CHEMICAL PROPERTIES OF DAMP WHEAT (20.0% MOISTURE) BEFORE AND AFTER RESPIRATION TRIAL FOR 17 DAYS AT 30°C.

Radiation Dosage	Germination		Fat Acidity		Fluorescence Scale Units		Transmittancy	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
rep	%	%	mg KOH/100 g				%	%
Untreated dry wheat[a]	96.0	..	14.0	...	22.6	...	14.3	...
0	...	7.0	...	53.0	...	23.6	...	17.9
25,000	88.0	2.0	16.4	57.0	19.3	22.8	16.9	16.9
125,00C	10.0	0.0	16.4	54.0	19.1	22.8	16.3	17.2
625,000	0.0	0.0	16.4	17.0	21.0	24.8	16.9	21.1
1,875,000	0.0	0.0	15.6	16.0	24.0	31.4	18.1	30.0
3,750,000	0.0	0.0	15.6	16.0	28.0	40.4	19.6	44.3

[a] Moisture content 8.3%.

Fat-acidity values indicated that irradiation had virtually no effect on splitting of fat at any level of treatment. On the other hand, fat hydrolysis increased markedly when molds developed on samples not sufficiently irradiated to produce sterilization.

Fluorescence values, which indicate protein-sugar interaction (Maillard or browning reaction), were intensified by very high radiation dosages and the deterioration became more pronounced with subsequent storage of the treated grain. This result agrees with the observation of McWilliams *et al.* (5) that storage after treatment with high levels of irradiation produces a darkening of the flour and resulting bread. The final column of Table I, captioned "Transmittancy" (permeability to light of potassium sulfate solution extracts), indicates that the colloidal properties of wheat proteins were damaged by high levels of irradiation, that the change is intensified by the storage period, and that this effect parallels the browning previously noted.

Irradiation of Dry Wheat

In another experiment, dry grain (12% moisture) was irradiated at various levels and the effects observed. The grain was then dampened to 20% moisture content to permit surviving fungi to grow and respire. The response of the dry grain in terms of respiration and chemical change was virtually identical to that of the same grain irradiated when it contained 20% moisture. The only important difference observed was a somewhat greater resistance of the dry grain to germinative damage by irradiation. Subsequent study established that if the respiratory pattern of the grain dampened after treatment in the dry state is accepted as an index of mold growth, the minimal radiation level required for fungal sterilization of dry grain, and probably also of damp grain, was in the neighborhod of 250,000 rep.

Effect on Baking Properties

To evaluate effects of wheat irradiation on flour properties, larger quantities of grain were treated at the Materials Testing Reactor at Idaho Falls, Idaho, through the courtesy of the Quartermaster Food and Container Institute of the Armed Forces. The irradiated grain was milled to flour and additional analyses specifically relevant to baking behavior were carried out, including sedimentation value, maltose value (diastatic activity), amylograph test, and physical dough tests by a farinograph and an alveograph.

The irradiation schedule applied to the wheats, and the chemical properties of the resulting flours, are shown in Table II. It is clear that the change in colloidal properties of proteins observed in previous experiments is reflected in a regular decrease in sedimentation value, which indicates a loss in the aqueous imbibitional capacity of the wheat gluten protein. The regular increase in maltose value with irradiation suggests either a stimulation of amylase enzyme activity or an increase in susceptibility of starch to the enzymes. That the latter alternative is the correct one is borne out by the starch gelatinization viscosity curves provided by the amylograph as shown in Fig. 3. These data suggest that the starch was progressively degraded by irradiation to such an extent that at the 1,000,000 rep dosage the molecular size was too small to permit gelatinization.

TABLE II

BIOCHEMICAL PROPERTIES OF FLOUR MILLED FROM IRRADIATED WHEAT

Irradiation Dosage	Moisture	Protein	Ash	Sedimentation Value	Maltose Value	Maximum Amylograph Viscosity
rep	%	%	%	*ml.*	*maltose/10 g*	*B. U.*
Control—0	12.9	13.8	0.39	41.1	179.0	960
125,000	13.2	13.6	0.37	37.4	185.5	520
250,000	13.5	13.8	0.37	34.9	207.6	330
500,000	13.7	13.9	0.37	29.5	222.3	180
1,000,000	13.8	13.8	0.35	21.8	249.3	90

A summary of the effects of irradiation on physical properties of dough is given in Fig. 4. Irradiation decreases dough development time and increases rate of breakdown following optimum development, indicating a structural degradation of the gluten protein. These results confirm clearly the trends suggested by the transmittancy and sedimentation values. The alveograph tests indicate that dough stiffness (curve height) is increased by irradiation, whereas extensibility (curve length) is decreased. Irradiation, therefore, causes dough to lose strength and to become stiff and less elastic.

Loaves were baked from these flours by a rich commercial straight-dough formula that included yeast, sugar, salt, nonfat dry milk, malted wheat flour, shortening, ammonium phosphate, and various levels of potassium bromate. The breads obtained from the flours, shown in Fig.

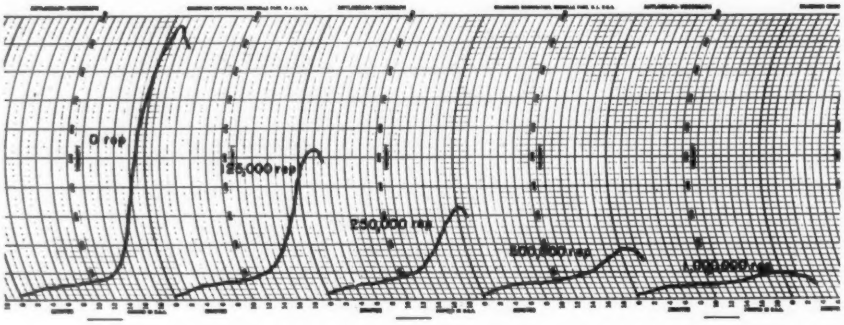


Fig. 3. Amylograph starch gelatinization viscosity curves for flour milled from irradiated wheats.

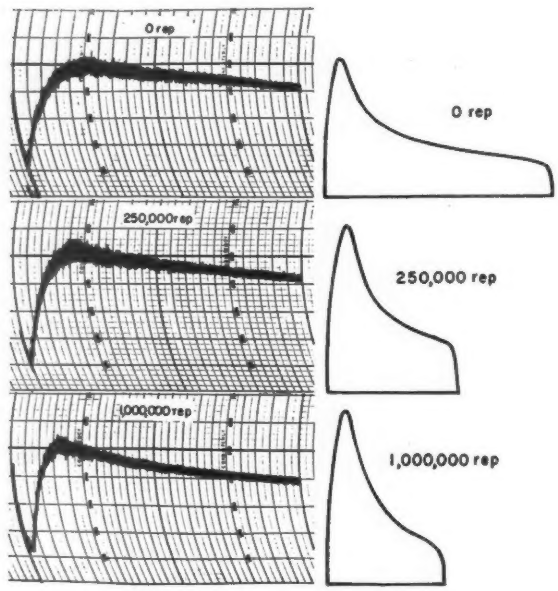


Fig. 4. Charts showing physical properties of doughs as affected by treatment of wheat with 0 rep, 250,000 rep, and 1,000,000 rep of gamma radiation. Farinograms are on the left and alveograms on the right.

5 and described in Table III, were remarkably good even at high treatment levels which caused marked changes in the biochemical and rheological properties.

TABLE III

QUALITY CHARACTERISTICS OF BREAD DERIVED FROM IRRADIATED WHEAT

IRRADIATION DOSAGE	LOAF VOLUME (ml.)[a] AT VARIOUS POTASSIUM BROMATE LEVELS (%)			LOAF SCORE [a,b] AT VARIOUS POTASSIUM BROMATE LEVELS (%)		
rep	*0.000*	*0.001*	*0.003*	*0.000*	*0.001*	*0.003*
Control—0	2633	2962	3000+	82	92	94
125,000	2745	2970	3000+	83	93	95
250,000	2702	2972	3000+	79	89	88
500,000	2745	2907	3000+	78	84	85
1,000,000	2490	2890	2938	66	73	73

[a] Replicate loaves.
[b] Max. score = 100.

There was a strong indication that the lower irradiation levels improved loaf quality somewhat, an effect comparable to that of adding potassium bromate. In many bread-wheat flours some modification of starches or proteins is desirable to produce loaves of optimum quality. This beneficial modification is usually provided by enzymes and oxidizing agents during the fermentation and oven-warmup steps of baking. Perhaps some of these desirable changes can also be effected by irradiation. It is interesting to speculate that such treatments may prove useful in modifying flours for specific purposes.

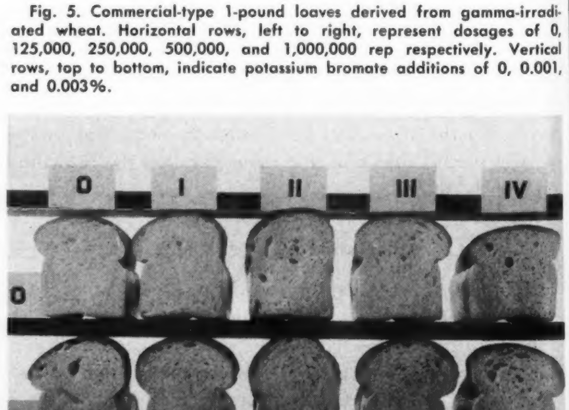
Conclusions

Among the conclusions to be drawn from these studies is that the respiratory pattern reflecting growth of grain spoilage fungi on freshly dampened grain can be eliminated in hard red winter wheat at moisture levels of 12% and 20% by gamma-radiation treatment as low as 250,000 rep. An improvement in the storage properties of grain might result from such treatment, provided that reinfection by storage fungi is prevented. Seed germination is totally eliminated in damp wheat by radiation dosage somewhat beyond 125,000 rep, but 625,000 rep are required to destroy the viability of grain containing 12% moisture. Hydrolysis of fat does not occur with dosages even as high as 3,750,000 rep.

Megarep treatments appear to initiate a browning reaction which increases with subsequent storage of the grain or flour. Mold growth on nonsterile wheat samples does not produce this effect. Changes in protein solubility and imbibitional capacity parallel the browning tendency. These deleterious effects were not observed at dosage levels below 625,000 rep.

Flour milled from irradiated wheat shows an elevated maltose value. This autolytic sugar production appears to be associated with increased susceptibility of starch

Fig. 5. Commercial-type 1-pound loaves derived from gamma-irradiated wheat. Horizontal rows, left to right, represent dosages of 0, 125,000, 250,000, 500,000, and 1,000,000 rep respectively. Vertical rows, top to bottom, indicate potassium bromate additions of 0, 0.001, and 0.003%.



to amylase attack due to extensive irradiation damage of starch granules. This damage to the starch fraction is clearly reflected in sharply reduced maximum gelatinization viscosities. Irradiation of wheat causes doughs to lose strength, to become stiffer and less extensible, and to have shorter development time and an increased tendency to break down with overmixing. Bread quality as assayed by commercial procedures appears to be improved by treatment of the wheat with 125,000 rep, but higher dosages produce inferior results. This effect was analogous to that obtained from adding potassium bromate. It is probable that a minor degree of starch and protein modification in strong wheat, such as may be produced by radiation treatment, would be beneficial to loaf quality. That wheat or flour might be modified by radiation treatment to suit specific technological purposes seems possible from these studies.

Literature Cited

1. AMERICAN ASSOCIATION OF CEREAL CHEMISTS. Storage of cereal grains and their products, ed. by J. A. Anderson and A. W. Alcock. The Association: St. Paul, Minnesota (1954).
2. BROWNELL, L. E., HARLAN, H. A., and NEHEMIAS, J. A. A preliminary study of the effect of gamma radiation on the baking quality of flours. *Food Technol. 9:* 620–623 (1955).
3. GILLES, K. A., KASLOW, H. D., and ANDREWS, J. S. Some observations on the effect of ionizing radiation on flour and its components. Am. Assoc. Cereal Chemists, abstract presented at 41st annual meeting, May 1956.
4. HASSETT, C. C. Current status of insect control by radiation. *Science 124:* 1011–1012 (1956).
5. MCWILLIAMS, C. S., FELSHER, A. R., POMERANTZ, R., and MCMULLEN, J. J. Explanatory studies on the effect of ionizing radiation upon the baking properties and storage stability of an unbleached winter wheat bread flour. Am. Assoc. Cereal Chemists, abstract presented at 41st annual meeting, May 1956.
6. MILNER, M., and YEN, Y. C. Treatment of wheat with ionizing radiations. III. The effect on breadmaking and related properties. *Food Technol. 10:* 528–531 (1956).
7. YEN, Y. C., MILNER, M., and WARD, H. T. Treatment of wheat with ionizing radiations. II. Effect on respiration and other indices of storage deterioration. *Food Technol. 10:* 411–415 (1956).

A.A.C.C.

LOCAL SECTIONS

Canadian Prairie Section members gathered on March 19 for their usual dinner meeting, in the Grain Exchange Building, Winnipeg. After dinner in the Basement Cafeteria, the group assembled in Room 138 to hear S. Kanee of the Soo Line Flour Mills, Winnipeg, relate "Some observations based on a recent trip to Europe."

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Northwest Section members met for luncheon at Dayton's Sky Room, Minneapolis, on March 29, to hear Finn Larsen speak on "The research philosophy at Minneapolis-Honeywell." Dr. Larsen is research director of Minneapolis-Honeywell Regulator Co., producer of many scientific and precision instruments.

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On March 13, in San Francisco, Northern California Section's dinner-meeting speaker was Alador Fonyo, vice-president and director of research of William J. Stange Co., Chicago. Mr. Fonyo spoke on "Present-day uses of spices in food products" and offered a well-spiced verbal menu: identification of flavor principles; stabilization of spice pigments; extraction methods of spices and flavors; and the uses of spices and their ultimate effect on food flavors. Henry's Fashion Restaurant was the meeting place for dinner. The cooks, no doubt, were tipped off to do their spicing with discretion.

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Midwest Section's April 1 meeting had two speakers. William E. Anklam, General Mills, Minneapolis, discussed "How commercial research guides technical research in the development of new products." (Mr. Anklam's article, with co-author K. L. Thomas in March *Cereal Science Today*, perhaps covers essentially the same ground.) David R. Peryam, QM Food & Container Institute, Chicago, spoke on "Human factors in food evaluation"—how human behavior is directly concerned with the evaluation of food products. He also discussed the major influences which are sources of variability in flavor and acceptance testing.

The Section's May meeting, on the 6th, will consist of a tour of the Argonne National Laboratories.

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Pioneer Section met on April 12 and 13 at Hotel Lassen, Wichita, Kansas, beginning with evening committee meetings on the 12th. Next day, after a brief business session, members and guests heard John A. Johnson (Kansas State College) on the subject, "Know the functions of ingredients in baking"; James M. Doty (Doty Laboratories) on "How to make a bakery service call and what to look for to correct bread quality"; and Sam D. Fine (U.S. Food & Drug) on "How the Food and Drug Administration looks at flour." After luncheon, trophies were awarded for the best determination on Pioneer Section check samples.

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At the March meeting of New York Section, Edward Alesch (Western Condensing Co. of Appleton, Wisconsin) spoke on the functional and nutritional value of edible

whey solids, outlining the production techniques and uses of this new dairy solid for the food industry. The solids will also accentuate flavor, Mr. Alesch said. The product is being used in a wide variety of food products and in such baked foods as bread, rolls, pies, cakes, doughnuts, icings, and fillings. It may be incorporated as an additional food supplement or as the sole dairy ingredient.

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The Niagara Frontier Section held their March meeting at the Erie County Technical Institute on the 11th. The speakers were C. O. Gourley and Lew Mix of the Beacon Milling Co., Cayuga, N. Y.

The next meeting was held on April 8th. Melvin Firman, Director of Technical Services of the Food Industries Division of American Cyanamid, talked on "Antibiotics and Food Products."

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The Northwest Section will hold its April meeting on the 26th at the central offices of the Red Owl Stores in Hopkins, Minnesota. A tour of the warehouse, bakery, and coffee roasting plant will be followed by a short business meeting. The group will be served lunch at 12:30 p.m. in the auditorium.

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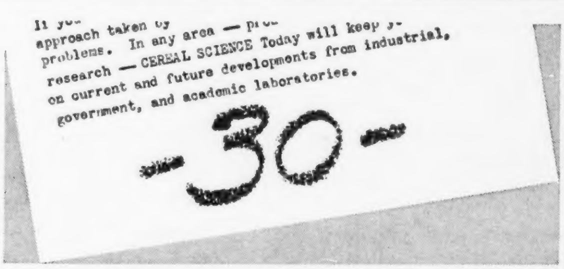
The Cincinnati Section will hold a Viscosity Clinic and a discussion of the new edition of Cereal Laboratory Methods on April 27, 10 a.m., Kroger Food Foundation.



PILLSBURY ANNOUNCES NEW TURBO MILLING PROCESS

After several years of speculation by the milling industry, Pillsbury has finally released preliminary information on their new milling process. The company claims that it is the first major break-through in flour milling technology since the introduction of steel rollers and aspirators.

Pillsbury attorney George Porter pointed out that announcement of the new process was delayed to insure adequate patent protection. "Application for broad patent rights covering use of the process both in the United States and abroad are now far enough along to permit a public announcement."

The company credits Tibor Rozsa, director of milling development, with spearheading research on the project. Also named in the patent applications are C. G. Harrel, Ralph Gracza, Truman Manning, and Arlin Ward.

Pillsbury milling technicians refer to the new process as "turbo grinding and turbo separation." It is based on an unusual application of the air vortex principle to create man-made "hurricanes" in which the flour particles are reduced and separated.

Using the process, Pillsbury has been able to produce entirely new kinds of flours, differing chemically and physically from any flours produced by conventional milling methods.

Production vice president John P. Snyder, Jr. said turbo milling has enabled Pillsbury to produce specialty flours without being entirely dependent upon wheat blends and crop changes to produce desired baking properties.

Snyder pointed out that Pillsbury is now producing flour on a commercial basis with a protein content above 20%. "This high protein count is a result of the milling method," Snyder said. "No dried gluten or other substances not originally found in the wheat kernel have been added." The flour also has a low ash content, characteristic of short patent bakery flours but unusual in high protein flours.

Pillsbury's new process is the result of many years of research in the company's Minneapolis milling development laboratories. Pillsbury began experimenting with the process shortly after World War II. Turbo mills have been operating on a production basis since 1953 in some of the company's plants. A 500,000 dollar turbo milling installation will go into operation at the Enid, Oklahoma, plant this month.

HEEDLESS HORSEPOWER

"Heedless Horsepower" has been named by The Travelers Insurance Companies as the fundamental cause of our ever-mounting toll of disaster on U.S. highways.

The 23rd annual highway safety booklet just published by The Travelers reports on the 1956 highway toll that saw 40,000 Americans lose their lives and 2,368,000 more injured — an increase of nearly 6% in fatalities and almost 10% in injuries over the 1955 record. More than 2,700,000 copies of the booklet have been printed for free distribution.

Despite the large number of safety devices embodied in cars today, any combination of speed plus carelessness, thoughtlessness and lack of consideration turns the present high-powered cars into missiles of death.

In reviewing last year's grim record, the report shows that excessive speed again topped the list of driver actions resulting in death. A total of 13,830 died and 798,920 were injured in crashes blamed on speed.

We sincerely hope that the many AACC members attending the San Francisco meeting will keep these statistics in mind if they drive.

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